US Army Corps
of Engineers
Waterways Experiment
Station

Methodology Development for Characterizing Worldwide Background Conditions Relative to Smart Munitions

by   Mark R. Graves

WES

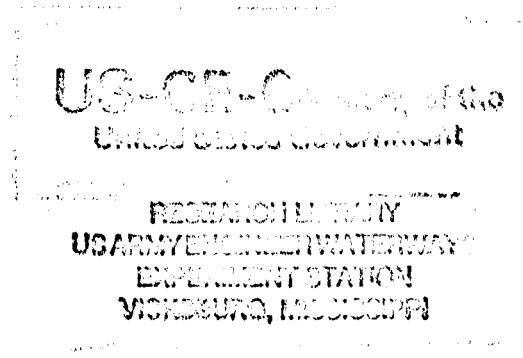Technical Report EL-95-19
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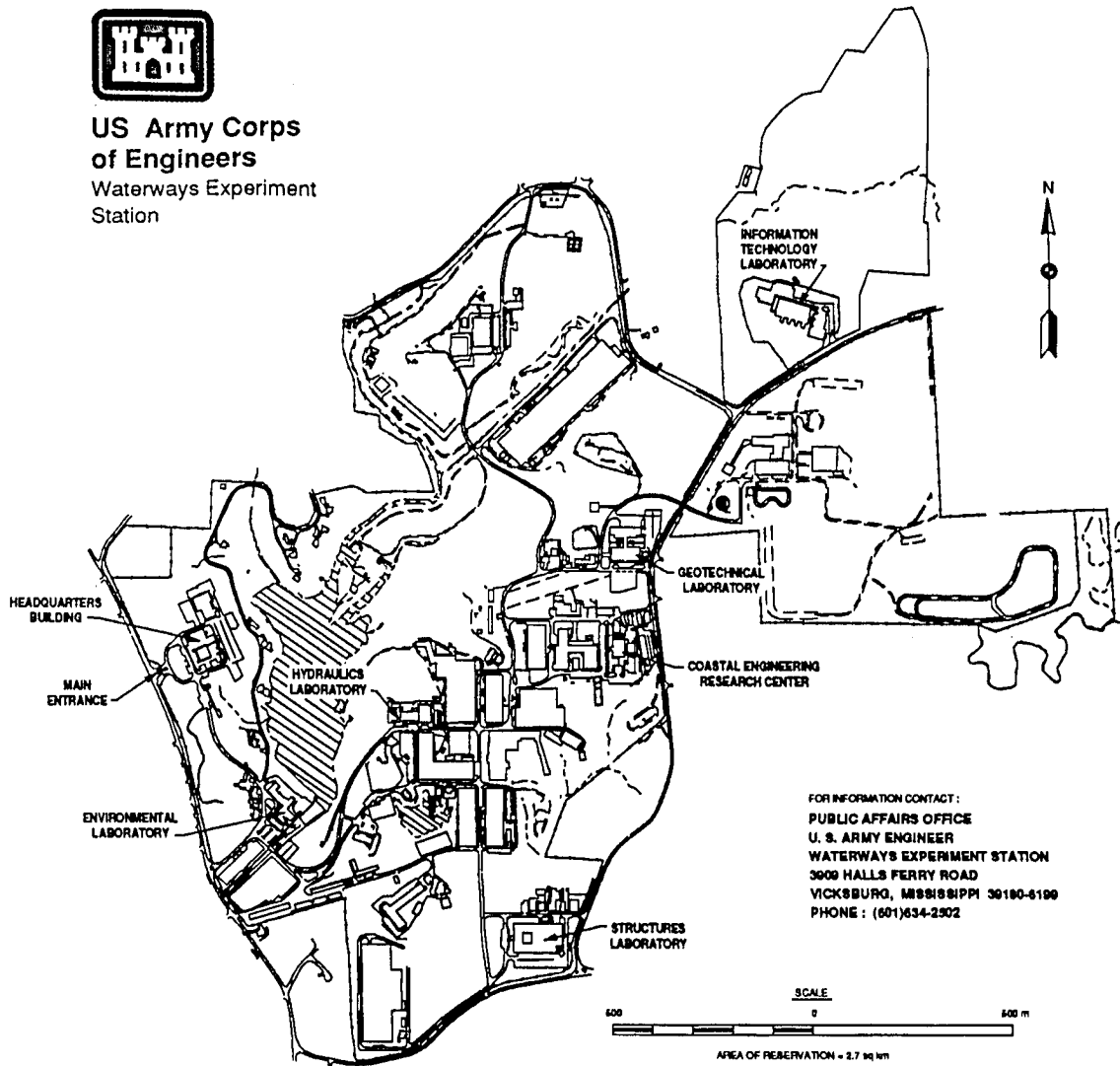Vicksburg, MS   39180-6199

Final report

US Army Corps of Engineers
Waterways Experiment Station

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Preface

The study reported herein was conducted by the U.S. Army Engineer Waterways Experiment Station (WES) in support of the Smart Munitions Working Group (SMWG), Joint Technical Coordinating Group for Munitions Effectiveness. This effort was funded by SMWG and managed by the U.S. Army Materiel System Analysis Agency, Aberdeen Proving Ground, MD. Mr. Julian Chernick was chairman of SMWG and was technical monitor for the WES study.

This study was conducted under the supervision of Dr. John W. Keeley, Director, Environmental Laboratory, WES; Dr. Robert M. Engler, Chief, National Resources Division (NRD); and Mr. Harold W. West, Chief, Environmental Characterization Branch (ECB), NRD. Mr. Mark R. Graves, ECB, prepared this report.

At the time of publication of this report, director of WES was Dr. Robert W. Whalin. Commander was COL Howard K. Bruce, EN.

This report should be cited as follows:

1 Introduction

Background

   The function of the Joint Technical Coordinating Group/Munitions
Effectiveness (JTCG/ME) Smart Munition Working Group (SMWG) is to
validate, develop, and standardize smart munitions effectiveness models and
data for smart munition systems as they enter the weapons inventory. The
established procedure for this is through the generation of Joint Munition
Effectiveness Manuals (JMEM). JMEM's provide field commanders with
succinct information on numbers of munitions to use against various targets as
a function of important scenario and external conditions. Testing and evalua-
tion of developing smart munitions have demonstrated that they are highly
sensitive to variations in background conditions. Terrain and weather vari-
ables comprising background conditions must therefore be included as factors
in JMEM tables.

   This understanding is reflected in the "roadmap" developed by SMWG for
generation of the JMEM tables. Target signatures (synthetic and/or measured)
are emplaced into background signature scenes (synthetic and/or measured)
creating target-in-background scenes. These scenes are input to sensor proces-
sor models (representing specific smart munition systems) which make perfor-
mance predictions for that specific scenario. Repeating this process for many
scenarios supplements limited captive-flight performance data to populate a
performance database. The resulting performance databases are used by the
GENESIS model to make effectiveness predictions which populate the JMEM
tables. This roadmap represents a potentially expensive and time-consuming
process for both computer and analyst. The questions therefore arise:
(a) how should background conditions be specified for development of JMEM
tables? and (b) what represents a sufficient set of scene conditions? Without
some guidance or constraint on the number of background conditions
employed, the process could become completely unmanageable. The
U.S. Army Engineer Waterways Experiment Station (WES) accepted SMWG
funding to undertake this task.

   The goal is to specify a sufficient set of background scenes to be represen-
tative of the terrain and weather conditions under which smart munitions will
potentially be used. The objective is to develop an objective analytical

methodology to characterize worldwide background conditions relative to smart munitions. This report addresses the development of such a methodology.

Smart munitions make target acquisition decisions based on processing of data sensed from one or more wavebands. Thermal infrared and millimeter wavebands are commonly used. Therefore, attribute selection was limited to those that were expected to affect terrain signatures in these wavebands. Further, the worldwide scope of the task suggests that only coarse macro-scale environmental attributes should be considered in this initial effort.

Several approaches to the problem were considered, ranging from manually digitizing information from paper map sources and atlases to using satellite imagery covering the areas of interest. For an approach to be applicable in all potential conflict areas, the same quality and types of data should be available over all the areas. After an exhaustive data search, it was determined that the best way to proceed was to utilize existing digital datasets. Many datasets were evaluated, including the Defense Mapping Agency's Digital Chart of the World, Interim Terrain Data (ITD) and Digital Feature Analysis Data (DFAD) products, and the global CD/ROM produced by the U.S. Army Corps of Engineers. Many of these datasets were rejected, because coverage was incomplete over a number of areas or because the quality of information regarding environmental parameters was insufficient.

The main goal of this study was to develop and test a procedure for characterizing the earth's environmental attributes. Results from this analysis will be used to guide further research in refining the methodology and presenting a final environmental classification. Therefore, results from this effort should be considered a preliminary product.

The Global Ecosystems Database

The dataset chosen for this study was the Global Ecosystems Database. Jointly produced by the Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) (NOAA-EPA 1992) to support global change research. The database was developed to serve as an "...integrated global database (including time sequences and model outputs) and quality assurance for spatially distributed characterization and modeling support related to global environment and ecological change" (NOAA-EPA 1992). The database includes 13 global datasets detailing vegetation, soils, land cover, climate, and topography at resolutions ranging from 2 min to 1 deg.

Environmental Classification and Regionalization

The approach chosen to process the digital datasets is usually referred to as environmental classification or regionalization. Environmental classification may be defined as a procedure for grouping spatial units or objects into groups (i.e. classes or types) that possess similar characteristics based on a selected set of attributes. In other words, areas that have similar environmental attributes are grouped together to form classes which represent "like" areas. The methodology is based on statistical analysis procedures commonly used to process multispectral imagery. One of the benefits of using a statistics-based clustering approach is that the definition of class boundaries becomes a totally objective rather than subjective task. In addition, whereas a human interpreter drawing class boundaries on a map may be limited to analyzing two or three layers (or types) of attributes with a limited number of categorizations of each, statistical clustering algorithms operate on measured data values in a theoretically unlimited number of parameters with commonly 256 distinct levels in each parameter.

2 Methodology

The methodology utilized in this exercise is an adaptation of that used in a similar effort by the Environmental Resources Information Network (ERIN) in Australia (Thackway and Cresswell 1992) to develop regionalizations of Australia for environmental monitoring and modeling support. Like the Australian research, all work was conducted using geographic information system (GIS) and image-processing tools. Differences in the two techniques stem mainly from the data available for this effort and in the specific clustering algorithms employed.

Overview of Methodology

The development of a multivariate technique for characterizing the earth's environment required defining a core set of attributes for use in the classification process. The attributes selected are relevant to terrain signatures in wavebands used by smart munition sensors. The environmental data selected comprise four environmental themes: topography, air temperature, rainfall, and vegetation.

Unlike the procedure for this study, Australian researchers used soils information instead of vegetation data. Their reasons for excluding vegetation centered around lack of information at the level of detail they required. One of the requirements of a statistical approach such as the one employed in this study is that data must not be nominal in nature. Soils data available through the Global Ecosystems Database were nominal (or categorical) in nature and therefore would have been impossible to use. Moreover, vegetative cover probably makes a greater impact on the effectiveness of smart munitions sensors. In addition, vegetation is reflective of both natural and historical processes acting on the landscape; soils data would not reflect man-induced landscape changes.

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Data Preparation

The Global Ecosystem Database is provided in CD-ROM format with all data files in IDRISI format. IDRISI is a PC-based GIS software package distributed by Clark University (1992). Since the WES/Environmental Laboratory uses the ARC/INFO (ESRI 1991) GIS software, it was necessary to · write software that would reformat the datasets into ARC/INFO GRID format. The EPA assisted in this effort by furnishing a UNIX C-shell script which, with modification, was used to load the data into ARC/INFO.

A number of operations were required in ARC/INFO to prepare the data for statistical processing. Because the classification algorithm chosen for this study was limited to operating on eight-bit, integer data, it was necessary to rescale the original values into an eight-bit range. After this was completed, the eight individual attribute files (two from each environmental theme) were combined into an eight-channel ERDAS file. ERDAS (Earth Resources Data Analysis System) is a remote sensing, image processing package that was used for the statistical clustering process (ERDAS 1991).

The data were utilized in a raster format to facilitate numerical analysis within a raster GIS and an image-processing package. A grid of 10- by 10-min cells (0.167 deg) was defined for data and analysis. This represents an array of 1,078 rows by 2,156 columns or a total of over 2.3 million grid points for each attribute (the Arctic and Antarctic areas were excluded from processing). This rather coarse cell size was necessary because of the limit of the source dataset.

Environmental Attributes

Two attributes were derived for each of the environmental themes. An equal number of attributes from each theme was used to avoid giving more weight to any one environmental theme. The environmental themes and the associated attributes are listed in Figure 1.

```
Terrain Attributes ──────┬─ Mean Elevation
                         └─ Relief (max-min)

Temperature Attributes ──┬─ Mean Temperature
                         └─ Temperature Range (max-min)

Precipitation Attributes ┬─ Mean Precipitation
                         └─ Precipitation Range (max-min)

Vegetation Attributes ───┬─ Mean Greenness Index
                         └─ Range in Greenness Indices

Total Number of Attributes:   8
```
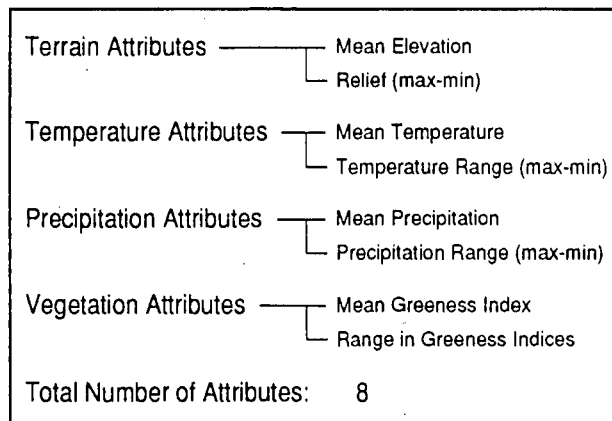
Figure 1.   List of themes and derived attributes

Topography

Elevation data were obtained from a 10-minute terrain dataset originally distributed by the U.S. Navy Fleet Numerical Oceanography Center (NFNOC) in Monterey, CA (FNOC 1992). This dataset was developed during the period of the mid-60's to the early 70's; the main source was the U.S. Department of Defense Operational Navigation Charts (ONC), scale 1:1,000,000. Elevations are presented in meters, with a resolution of +/-10 m. The elevation data used represents the modal elevation within each 10-min grid cell.

In addition to presenting the modal elevation, the dataset includes the maximum and minimum elevation within each grid cell. This information was used to calculate the relief within each grid cell (maximum - minimum).

Temperature and precipitation

Temperature and precipitation data were obtained from the IIASA (International Institute for Applied Systems Analysis) Mean Monthly Temperature, Precipitation, and Cloudiness data set included on the Global Ecosystems Database (Leemans and Cramer 1992). This data set was developed from a lengthy list of sources, including the U.S. Weather Bureau, the U.K. Meteorological Office, and Soviet and Chinese data. Values of temperature and precipitation are characteristic monthly values for the period from 1931-1960. According to the data set documentation, this represents a rather stable period.

Temperature data are represented in the dataset as average annual surface air temperature in 1/10th °C. Precipitation is represented in mean monthly precipitation (mm/month). Additional attributes of range in monthly mean temperature and monthly precipitation were obtained by isolating the maximum and minimum values, then subtracting the minimum from the maximum. High values of these variables are indicative of significant seasonal climatological change.

The dataset is distributed on a 30-min geographic (lat/long) grid. Because the other data used in this analysis were 10-min data, it was necessary to regrid these to a 10-min grid size.

Vegetation

Information concerning the density and greenness of vegetation over the earth's surface was acquired by using the Monthly Generalized Global Vegetation Index (MG-GVI) dataset distributed by the National Oceanic and Atmospheric Administration (NGDC 1992). This dataset represents a standard monthly product of NOAA that is computed using data from the Advanced Very High Resolution Radiometer (AVHRR) sensors on the NOAA Polar Orbiting Environmental Satellites. The AVHRR is a multispectral sensor operating in five portions of the spectrum.

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The AVHRR bands used for monitoring vegetation are Channel 1, a visible band (0.58-0.68 μm), and Channel 2, a near infrared band (0.73-1.0 μm). Various mathematical combinations of the data from these bands are useful indicators of the presence of green vegetation and are therefore referred to as vegetation indices. The basic index employed by NOAA is the Unscaled Normalized Difference Vegetation Index (XVI), defined by the following equation:

$$XVI = (CH2 - CH1)/(CH2 + CH1)$$

The data presented in this dataset have been further processed to scale them to integer values from 0 to 255, according to the formula $NDVI = 240 - (XVI + 0.05)*350$. In processing, the values are inverted (by subtracting from 255) so that high values in the data correspond more intuitively to high vegetation signals. Therefore, the values presented in the dataset were derived from the original XVI product by the formula:

$$NDVI = (XVI + 0.05) * 350 + 15$$

The satellite images represent monthly averages of weekly data and are derived according to an intensive procedure defined in the Global Ecosystems Database documentation (NOAA-EPA 1992).

Several problems influence GVI values, including calibration "drifts" resulting from changes in orbital characteristics and sensor aging. Therefore, one must exercise "caution" in using these data. Unfortunately, no single accepted calibration yet exists. However, these data were used since they represent the best available at the present time.

The study used average annual GVI and the range of monthly GVI. Combined, these two variables provide a great deal of information regarding global vegetation characteristics. For example, areas with high average GVI and a low range of GVI may indicate "evergreen" areas such as rainforests or dense coniferous vegetation. Areas of medium high average GVI and very high GVI range may indicate seasonal agriculture or deciduous forests. Areas with low values for GVI and low range GVI would indicate sparse to barren (non-vegetated) areas such as deserts.

Selection of environmental attributes

Selection of the environmental attributes was driven by two principal factors: relevance to terrain signatures and data availability. The Australian researchers conducted an extensive analysis of 25 environmental attributes before selecting 12 for processing. This included conducting a correlation analysis to isolate highly correlated parameters. Highly correlated variables tend to be poor discriminators in numerical classification. In the Australian

study, an absolute value of 0.3211 was considered a significant correlation at the 0.1-percent level (Murdoch and Barnes 1970). Although the Australians presented correlation analysis results only among individual themes (i.e. all temperature attributes, rainfall attributes, etc.) and not between themes (rainfall attributes compared with temperature attributes), it was decided that such a comparison might be useful in isolating strong relationships between environmental themes. As expected, several such relationships were noted.

A number of the attributes show a relatively high correlation (Table 1). Unfortunately, it is difficult to totally avoid highly correlated variables, especially when dealing with environmental attributes which are intrinsically linked. Indeed, the Australian researchers were forced to make use of several very highly correlated attributes despite the fact that they had 25 different candidates from which to choose. Because this study was operating under an extremely tight timeframe, it was impossible to derive and test a large number of candidate attributes. Results of the Australian comparisons were used to guide attribute selection.

Table 1
Correlation Matrix for the Eight Environmental Attributes

Mean Rain	Range Rain	Mean Temp	Range Temp	Relief	Mean Elev.	Mean GVI	Range GVI
1.000							
0.767	1.000						
0.450	0.486	10.000					
-0.581	-0.562	-0.799	1.000				
0.104	0.109	-0.119	-0.071	1.000			
-0.093	0.001	-0.206	-0.023	0.507	1.000		
0.625	0.535	0.511	-0.417	0.031	-0.145	1.000	
0.136	0.095	-0.154	-0.256	-0.053	-0.166	0.524	1.000

The Statistical Clustering Process

The ERDAS image-processing software provides a number of algorithms for statistically clustering or "classifying" multidimensional data. For this study, a nonsupervised, iterative, clustering approach was chosen to generate class parameters. The clustering algorithm that was selected is the ISODATA method. ISODATA stands for "Iterative Self-Organizing Data Analysis Technique" (Tou and Gonzalez 1974). This algorithm is very effective at recognizing inherent patterns in complex data arrays. Being iterative in nature, it is not biased to the top or bottom of datasets, an advantage over some other clustering algorithms. This type of bias would be particularly undesirable when working with a global dataset. ISODATA is also not as parametric as

other algorithms in ERDAS, a fact which makes it more suitable for data not normally distributed.

ISODATA operates by first asking the user for the number of classes desired, a convergence threshold (which represents the minimum percentage of change in the classification between iterations), the maximum number of iterations to be performed, and the minimum number of pixels allowed in a cluster. Next, the algorithm establishes initial cluster means in an arbitrary manner in n-dimensional space (where n = the number of layers in the dataset to be processed). Next, the algorithm moves through the dataset pixel by pixel, starting in the first line of data, and assigns each pixel to one of the means. This is accomplished by computing the spectral distance between the candidate pixel and each cluster mean. The pixel is assigned to the cluster mean to which it is closest.

At the end of each iteration, ISODATA recalculates the means of all the clusters based on all the pixels that have been assigned to them. In this way, the cluster means gradually shift to better reflect the actual patterns in the input dataset. ISODATA also calculates the percentage of pixels that have changed cluster assignments during each iteration. The percentage is then compared with the user-specified minimum change percentage to determine whether or not further processing is required. The process continues in this manner until ISODATA has gone through the maximum number of iterations requested through user input, or until the number of pixels assigned is below the minimum threshold.

Once the clustering analysis is completed and the cluster statistics are finalized, a preliminary classification product is produced based on a "minimum distance to the means" decision rule. The user may choose this as a final product or may feed the cluster statistics to a more advanced classification algorithm that uses additional information, such as the relative likelihood of a pixel to belong to a class, to assign the candidate pixels to each cluster. An example of such an algorithm is the maximum-likelihood (MAXLIK) program, that analyzes the means of each cluster, the number of pixels assigned to each cluster, and the "spread" or variance of each cluster when making pixel assignments.

Clustering Analysis

In this study, three groups of clusters were generated representing sets of 50, 75, and 100 classes. The resulting preliminary minimum-distance classifications were then analyzed to determine the validity of this procedure and to assist in evaluating how many classes are required to accurately portray the variety of the earth's surface in terms of the environmental parameters utilized. The results of the 100-cluster classification are shown in Figure 2. Class definitions from the 100-cluster initial classification are presented in Appendix A.
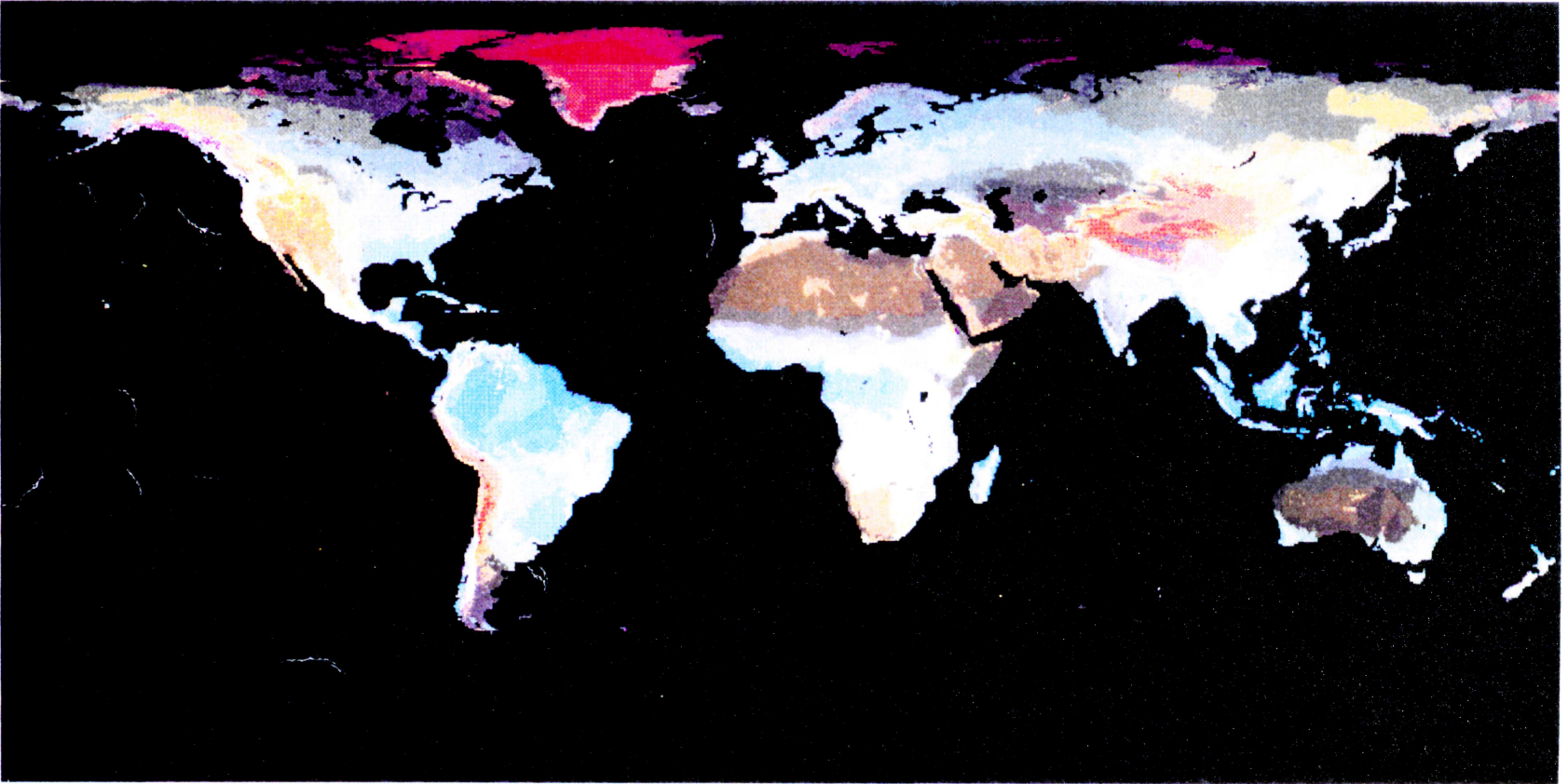
Figure 2.   Grayscale depiction of 100-cluster classification

3   Preliminary Results

The preliminary results obtained through this study are promising. Results from each of the three classifications reflect patterns which are consistent with expectations. However, several questions remain to be addressed by further work. Among these are: (a) how many clusters are required to sufficiently portray the earth's surface in terms of the selected attributes; (b) do the selected attributes represent the most appropriate parameters relative to smart munition performance; (c) is the source dataset (the Global Ecosystem Database) sufficient to provide the required level of detail; and (d) how do these classes relate to the inputs needed to generate standard scenes?

The question concerning how many classes are required for an environmental characterization is both an important and a complex issue. In this study, the preliminary results obtained from the 50-, 75-, and 100-class results are being analyzed by using statistical distance measures such as the transformed-divergence algorithm (Swain and Davis 1978). Results from these analyses will be used to determine whether individual classes should be merged or deleted. Tools such as these measure the statistical distance between clusters and assist in validating the statistical "robustness" of the classes, but they do not answer the equally important question of whether or not the classes are accurately portraying real-world phenomena. In other words, it is one thing to define classes that are statistically separable, but another to accurately assign this class to some environmental attribute of the landscape.

The questions regarding the resolution and content of the source dataset are critical ones. The Global Ecosystems Dataset was utilized in this study because it represented the best available global dataset containing the types of data required. Since it has been employed by a large body of researchers for global change investigations, this dataset has been subject to a great deal of quality control. It is hoped that, in time, data sources may become available that possess better resolution and content than existing sources.

The fourth question is critical to generating the information needed for input to the standard scene production. The spatial cells within this study are much larger than the areas which will be used to generate standard scenes (a few square kilometers). How can a representative few-square-kilometer area be selected from the large class areas? Two possible approaches are

suggested. The first would be to continue the process described using high spatial resolution data such as have been developed by WES (Ballard 1993 and 1994) for the Department of Defense Smart Weapons Operability Enhancement (SWOE) Program. The advantage of this would be that a specific location could be selected without subjective judgement. However, it appears unlikely that such data would be available for more than a few locations. Therefore, some subjective selection will be required. These judgements should preferably be made by individuals in the intelligence community who could identify likely conflict areas within a class. A second aspect of this question concerns what times of year and of day the standard scenes should be generated. Time-of-year information is contained in the present dataset. Range variables for temperature, rainfall, and GVI indicate pronounced seasonality within a class. Classes with high values of range variables indicate such areas. Figure 3 shows a plot of temperature and rainfall for class 63 of the 100-cluster classification. A well-defined wet season is evident during the months of July and August. Such plots could be generated from the source data for any class to identify specific times of year that should be used for standard scene generation. Time of day selection would require additional data sources, such as that available through the U.S. Air Force Environmental Technical Applications Center (ETAC).
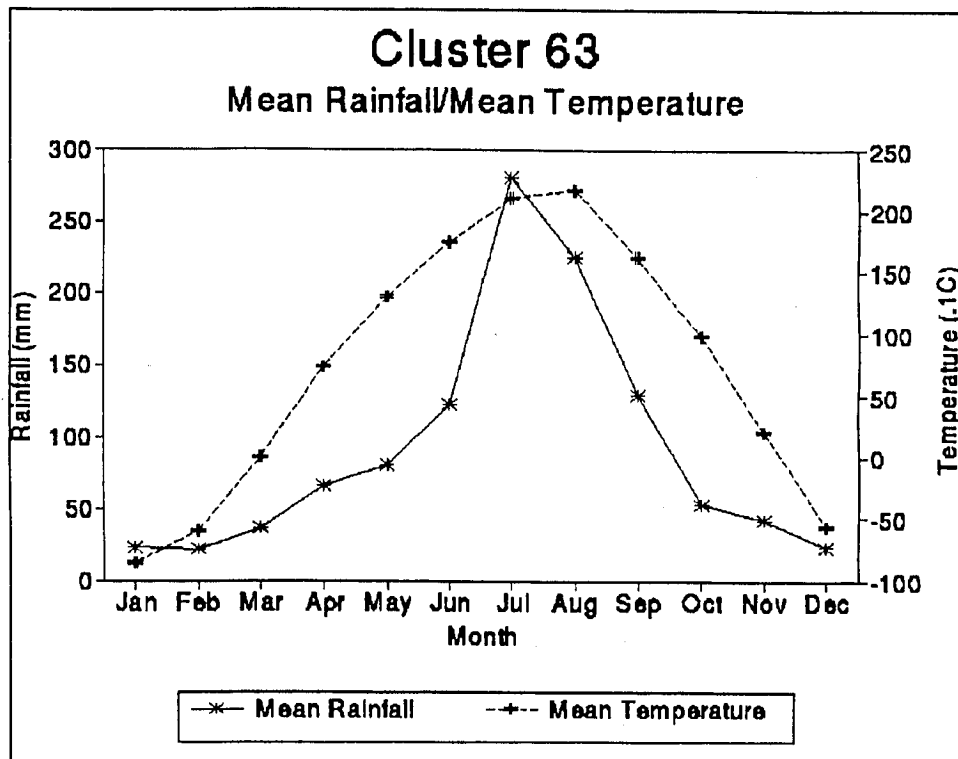
Figure 3.   Plot of monthly average temperature and rainfall for class 63

Special Areas of Interest

In developing this methodology, four areas were given special attention: the Korean Peninsula; the Kuwait-Saudi Arabia-Southeast Iraq area; Yuma, AZ; and Grayling, MI. Preliminary results were examined to compare similarities or differences which were reflected in the class assignments between these areas. From the 100-cluster classification, classes from the Yuma area compared quite favorably with the Middle East area. Two classes almost completely defined the entire areas in both cases: Class 39 covered the vast majority of both areas, while class 60 reflected areas with slightly more vegetation. Figure 4 shows a comparison of class 39 for both areas.

In the area of Israel, class 60 represented a good percentage of the area, although the area was much less homogeneous in structure than the Kuwait-Saudi Arabia-Iraq area. Although class 60 is also present in the Yuma area, a much larger and more uniform area of this class is present in the southwest area of Texas. Interestingly, in a 1981 study comparing the climates of selected locations in the United States with the climate of Beersheba, Israel, it was concluded that the area of El Paso, TX, represented the best model of Beersheba (Duchon 1981).

Much of the Korean Peninsula and northeast China was encompassed by class 63. There were no areas in the United States that represented a good analog to this class. The eastern, more mountainous areas of Korea were mostly defined by class 74 which compared nicely with the northwest portion of the state of Washington.

The area around Grayling, MI, was covered exclusively by class 49. This area was a good match for western Russia, particularly the area near Moscow.

It must be emphasized that these comparisons are based on "preliminary" results and should be used with CAUTION. Future work will consist of merging and deleting classes based on statistical distance measures, or refinement of parameters used in the preliminary analysis.
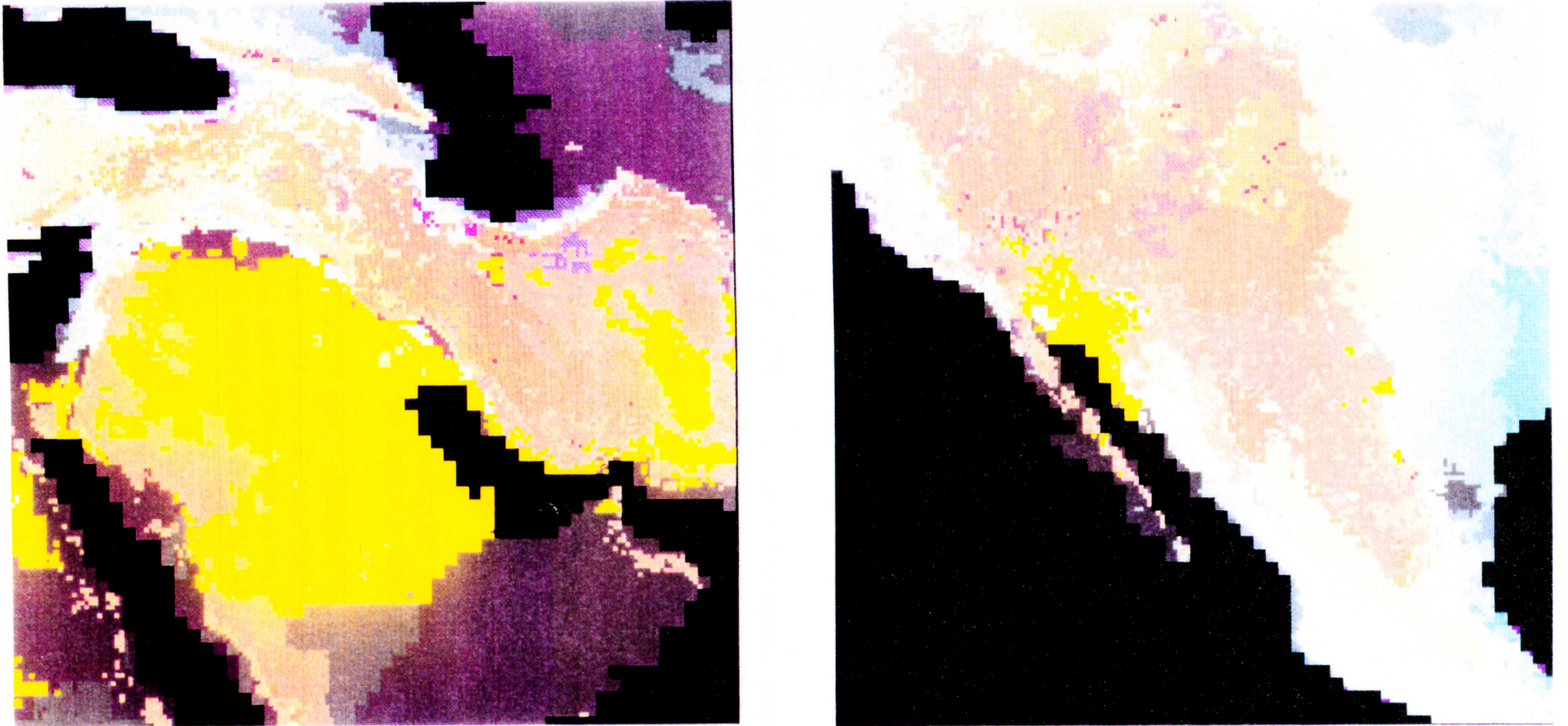
Figure 4.   Comparison of Middle East (left) and Yuma, AZ, (right) class 39 (in yellow)

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Appendix A
Listing of Class Statistics

Band 1	Mean Elevation	Band 5	GVI[1] Range
Band 2	Mean GVI[1]	Band 6	Rainfall Range
Band 3	Mean Rainfall	Band 7	Temeprature Range
Band 4	Mean Temperature	Band 8	Relief

[1] Global vegetation index.

Signature Name: CLASS 1

Number of points = 70

Band	1	2	3	4	5	6	7	8
Minimum	0	8	9	0	3	18	4	0
Mean	11.82	24.24	22.86	0.10	12.88	48.60	24.04	20.74
Standard	13.57	9.25	18.69	0.10	8.70	19.51	11.07	30.10
Maximum	59	52	73	0	56	71	39	118

Covariance Matrix

1	184.26	84.44	-23.53	0.00	-8.36	57.03	-15.00	351.92
2	84.44	85.60	-38.44	0.00	-13.07	60.43	-12.72	179.11
3	-23.53	-38.44	349.19	0.01	77.95	198.04	-169.57	-64.32
4	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.01
5	-8.36	-13.07	77.95	0.00	75.77	15.59	-26.96	-33.39
6	57.03	60.43	198.04	0.01	15.59	380.53	-196.30	199.27
7	-15.00	-12.72	-169.57	0.01	-26.96	-196.30	122.47	-61.97
8	351.92	179.11	-64.32	0.01	-33.39	199.27	-61.97	905.85

Signature Name: CLASS 2

Number of points = 18

Band	1	2	3	4	5	6	7	8
Minimum	13	53	168	0	30	140	5	19
Mean	61.19	68.61	169.21	1.51	60.91	150.17	8.61	94.21
Standard	27.16	9.29	2.15	1.51	19.04	14.51	3.06	39.64
Maximum	127	88	172	0	86	168	11	172

Covariance Matrix

1	737.70	-163.96	4.59	-2.41	-155.26	-17.24	-5.97	321.66
2	-163.96	86.36	-8.26	0.08	136.72	57.37	12.36	-4.51
3	4.59	-8.26	4.63	-1.20	-19.58	-24.97	-6.48	-5.32
4	-2.41	0.08	-1.20	2.29	-1.65	-5.80	0.93	-2.79
5	-155.26	136.72	-19.58	-1.65	362.52	147.29	30.00	127.40
6	-17.24	57.37	-24.97	-5.80	147.29	210.68	39.65	54.50
7	-5.97	12.36	-6.48	0.93	30.00	39.65	9.37	9.04
8	321.66	-4.51	-5.32	-2.79	127.40	54.50	9.04	1571.56

Signature Name: CLASS 3

Number of points = 828

Band	1	2	3	4	5	6	7	8
Minimum	0	30	45	46	7	0	29	11
Mean	82.76	47.96	105.24	102.64	44.49	92.34	83.06	94.62
Standard	25.95	10.50	25.72	21.44	17.61	20.63	20.60	31.16
Maximum	174	97	172	150	136	161	130	221

Covariance Matrix

1	673.15	-82.53	85.16	-273.84	-110.53	47.46	113.45	145.19
2	-82.53	110.21	-117.10	71.68	143.57	-49.12	57.09	-20.89
3	85.16	-117.10	661.37	-87.61	-96.60	372.02	-250.54	87.09
4	-273.84	71.68	-87.61	459.84	90.88	33.20	-239.20	-36.01
5	-110.53	143.57	-96.60	90.88	310.24	-2.90	54.27	-91.60
6	47.46	-49.12	372.02	33.20	-2.90	425.57	-178.00	14.30
7	113.45	57.09	-250.54	-239.20	54.27	-178.00	424.17	-53.51
8	145.19	-20.89	87.09	-36.01	-91.60	14.30	-53.51	970.76

Signature Name: CLASS 4

Number of points = 37

Band	1	2	3	4	5	6	7	8
Minimum	5	70	61	0	13	59	3	0
Mean	16.08	121.18	84.54	0.05	30.99	76.21	4.05	6.98
Standard	10.42	9.25	24.84	0.05	11.97	14.18	0.70	8.68
Maximum	43	131	126	0	75	98	5	32

Covariance Matrix

1	108.62	10.74	-178.26	0.00	-27.72	-20.42	-0.24	34.18
2	10.74	85.57	27.58	-0.01	-65.80	14.26	0.02	-3.86
3	-178.26	27.58	616.82	0.02	-44.80	262.67	-10.68	-1.10
4	0.00	-0.01	0.02	0.00	0.00	0.01	0.00	0.01
5	-27.72	-65.80	-44.80	0.00	143.38	-49.42	2.33	-1.57
6	-20.42	14.26	262.67	0.01	-49.42	201.09	-9.47	10.19
7	-0.24	0.02	-10.68	0.00	2.33	-9.47	0.49	-1.26
8	34.18	-3.86	-1.10	0.01	-1.57	10.19	-1.26	75.26

Signature Name: CLASS 5

Number of points = 962

Band	1	2	3	4	5	6	7	8
Minimum	0	31	30	61	7	46	12	0
Mean	10.84	56.59	67.85	103.95	48.31	97.67	74.16	57.75
Standard	18.27	10.83	22.41	19.72	24.07	21.43	15.91	33.62
Maximum	81	91	128	154	120	150	131	174

Covariance Matrix

1	333.74	26.67	259.05	123.45	91.66	-143.37	133.65	-252.74
2	26.67	117.38	56.38	7.79	219.77	-11.33	101.87	0.67
3	259.05	56.38	502.35	217.08	158.62	13.64	60.32	-190.09
4	123.45	7.79	217.08	388.84	20.32	-186.61	-45.68	-121.90
5	91.66	219.77	158.62	20.32	579.58	-32.02	241.91	60.28
6	-143.37	-11.33	13.64	-186.61	-32.02	459.08	-81.32	202.27
7	133.65	101.87	60.32	-45.68	241.91	-81.32	252.99	-82.03
8	-252.74	0.67	-190.09	-121.90	60.28	202.27	-82.03	1130.13

Signature Name: CLASS 6

Number of points = 6668

Band	1	2	3	4	5	6	7	8
Minimum	0	31	2	66	3	1	83	0
Mean	10.95	42.83	14.68	92.17	39.48	16.30	119.00	4.72
Standard	7.86	5.09	7.08	9.82	11.56	4.92	12.43	7.09
Maximum	59	58	41	127	66	60	158	42

Covariance Matrix

	1	2	3	4	5	6	7	8
1	61.78	9.89	26.12	19.74	22.84	6.68	-2.07	15.30
2	9.89	25.96	4.44	9.96	27.61	7.19	-1.73	5.53
3	26.12	4.44	50.07	35.42	2.18	17.32	29.28	1.85
4	19.74	9.96	35.42	96.34	12.06	25.04	15.44	0.38
5	22.84	27.61	2.18	12.06	133.60	-0.84	22.56	-16.81
6	6.68	7.19	17.32	25.04	-0.84	24.20	1.86	2.14
7	-2.07	-1.73	29.28	15.44	22.56	1.86	154.45	-30.71
8	15.30	5.53	1.85	0.38	-16.81	2.14	-30.71	50.25

Signature Name: CLASS 7

Number of points = 1524

Band	1	2	3	4	5	6	7	8
Minimum	0	0	6	76	0	6	32	0
Mean	21.97	0.03	12.56	96.74	0.01	12.78	66.44	30.85
Standard	12.97	1.10	3.83	7.67	0.20	2.24	8.64	20.21
Maximum	68	43	25	145	8	17	91	91

Covariance Matrix

	1	2	3	4	5	6	7	8
1	168.31	-0.62	15.94	-31.81	-0.12	-4.30	-10.59	132.02
2	-0.62	1.21	-0.16	-0.05	0.23	0.06	-0.86	0.51
3	15.94	-0.16	14.64	4.41	-0.03	0.75	-15.24	22.24
4	-31.81	-0.05	4.41	58.75	-0.01	-1.39	-46.11	-7.47
5	-0.12	0.23	-0.03	-0.01	0.04	0.01	-0.16	0.10
6	-4.30	0.06	0.75	-1.39	0.01	5.03	2.00	-6.00
7	-10.59	-0.86	-15.24	-46.11	-0.16	2.00	74.58	-24.30
8	132.02	0.51	22.24	-7.47	0.10	-6.00	-24.30	408.50

Signature Name: CLASS 8

Number of points = 1947

Band	1	2	3	4	5	6	7	8
Minimum	0	0	1	51	0	4	78	0
Mean	9.01	0.11	6.10	71.95	0.02	10.41	114.44	8.74
Standard	4.73	2.01	2.81	6.14	0.45	2.13	11.84	7.29
Maximum	39	39	19	94	10	22	134	27

Covariance Matrix

	1	2	3	4	5	6	7	8
1	22.39	-1.00	0.19	-9.63	-0.22	-0.27	6.74	16.61
2	-1.00	4.03	0.25	0.04	0.88	0.48	-0.92	-0.25
3	0.19	0.25	7.87	6.89	0.04	1.16	-6.10	3.40
4	-9.63	0.04	6.89	37.75	0.04	-1.11	-22.81	-4.53
5	-0.22	0.88	0.04	0.04	0.21	0.07	-0.22	-0.09
6	-0.27	0.48	1.16	-1.11	0.07	4.55	2.04	0.58
7	6.74	-0.92	-6.10	-22.81	-0.22	2.04	140.12	-4.61
8	16.61	-0.25	3.40	-4.53	-0.09	0.58	-4.61	53.16

Signature Name: CLASS 9

Number of points = 2355

Band	1	2	3	4	5	6	7	8
Minimum	0	0	1	38	0	6	97	9
Mean	20.88	0.05	3.66	62.36	0.01	10.39	120.95	34.41
Standard	8.01	1.42	2.69	9.01	0.36	2.44	10.53	9.18
Maximum	59	41	19	92	14	22	148	62

Covariance Matrix

1	64.13	-1.05	1.42	4.32	-0.26	-3.73	-5.76	-8.57
2	-1.05	2.00	0.42	-0.32	0.48	0.59	-0.60	0.18
3	1.42	0.42	7.24	12.51	0.10	0.57	-13.44	0.95
4	4.32	-0.32	12.51	81.21	-0.08	-6.22	-38.58	12.87
5	-0.26	0.48	0.10	-0.08	0.13	0.14	-0.15	0.04
6	-3.73	0.59	0.57	-6.22	0.14	5.95	-5.66	-2.27
7	-5.76	-0.60	-13.44	-38.58	-0.15	-5.66	110.83	-8.94
8	-8.57	0.18	0.95	12.87	0.04	-2.27	-8.94	84.30

Signature Name: CLASS 10

Number of points = 4885

Band	1	2	3	4	5	6	7	8
Minimum	97	0	1	0	0	5	97	0
Mean	121.44	0.00	2.09	8.42	0.00	7.80	113.78	4.86
Standard	12.17	0.00	1.07	7.85	0.00	1.91	8.95	5.51
Maximum	150	0	7	38	0	13	167	61

Covariance Matrix

1	148.11	0.00	1.12	-46.77	0.00	-11.75	-8.48	-20.75
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	1.12	0.00	1.15	2.55	0.00	-0.11	-3.58	-0.08
4	-46.77	0.00	2.55	61.62	0.00	-3.57	-38.38	1.53
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	-11.75	0.00	-0.11	-3.57	0.00	3.64	4.64	2.49
7	-8.48	0.00	-3.58	-38.38	0.00	4.64	80.12	12.91
8	-20.75	0.00	-0.08	1.53	0.00	2.49	12.91	30.38

Signature Name: CLASS 11

Number of points = 6136

Band	1	2	3	4	5	6	7	8
Minimum	74	30	2	0	10	3	47	0
Mean	138.96	36.18	15.33	22.48	34.53	17.19	95.97	3.84
Standard	16.29	1.78	9.20	16.36	3.95	6.88	20.73	5.80
Maximum	206	46	44	75	52	33	149	.49

Covariance Matrix

1	265.23	9.97	-13.87	-184.26	-46.13	21.65	-43.58	-34.11
2	9.97	3.16	10.21	8.77	-0.83	3.74	-13.44	-1.82
3	-13.87	10.21	84.63	104.83	14.09	36.75	-138.40	5.62
4	-184.26	8.77	104.83	267.54	44.72	15.68	-121.74	22.71
5	-46.13	-0.83	14.09	44.72	15.62	0.07	-13.98	7.35
6	21.65	3.74	36.75	15.68	0.07	47.29	-75.04	5.82
7	-43.58	-13.44	-138.40	-121.74	-13.98	-75.04	429.86	-13.93
8	-34.11	-1.82	5.62	22.71	7.35	5.82	-13.93	33.61

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Signature Name: CLASS 12

Number of points = 2883

Band	1	2	3	4	5	6	7	8
Minimum	51	0	1	3	0	5	98	0
Mean	83.52	0.10	2.48	25.55	0.13	9.33	120.45	15.71
Standard	11.13	1.84	1.85	11.14	2.26	2.29	10.74	10.44
Maximum	112	36	11	66	43	22	169	65

Covariance Matrix

1	123.97	0.53	1.44	-27.51	0.51	-6.12	-30.71	-25.85
2	0.53	3.40	0.74	1.08	4.14	0.80	-0.30	0.83
3	1.44	0.74	3.43	9.89	0.92	0.42	-9.94	-2.28
4	-27.51	1.08	9.89	124.16	1.32	-10.71	-53.58	-5.36
5	0.51	4.14	0.92	1.32	-5.11	1.03	-0.67	1.13
6	-6.12	0.80	0.42	-10.71	1.03	5.22	3.71	1.56
7	-30.71	-0.30	-9.94	-53.58	-0.67	3.71	115.36	38.58
8	-25.85	0.83	-2.28	-5.36	1.13	1.56	38.58	108.96

Signature Name: CLASS 13

Number of points = 2269

Band	1	2	3	4	5	6	7	8
Minimum	27	0	1	13	0	6	100	0
Mean	47.34	0.00	1.85	42.13	0.00	10.35	126.69	27.89
Standard	10.31	0.00	1.63	10.64	0.00	2.27	9.22	11.26
Maximum	74	0	8	85	0	15	169	56

Covariance Matrix

1	106.26	0.00	4.16	-7.03	0.00	-8.90	-10.30	9.07
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	4.16	0.00	2.66	6.79	0.00	-0.17	-6.94	-1.08
4	-7.03	0.00	6.79	113.27	0.00	-5.40	-41.37	-3.44
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	-8.90	0.00	-0.17	-5.40	0.00	5.17	-1.63	-1.48
7	-10.30	0.00	-6.94	-41.37	0.00	-1.63	85.08	19.37
8	9.07	0.00	-1.08	-3.44	0.00	-1.48	19.37	126.88

Signature Name: CLASS 14

Number of points = 3431

Band	1	2	3	4	5	6	7	8
Minimum	5	0	0	26	0	5	126	0
Mean	9.39	0.00	4.44	58.01	0.00	9.05	146.76	9.01
Standard	5.11	0.00	2.40	7.57	0.00	2.04	8.31	8.75
Maximum	31	0	11	74	0	15	175	38

Covariance Matrix

1	26.07	0.00	1.58	1.20	0.00	2.38	-4.53	25.45
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	1.58	0.00	5.74	5.25	0.00	1.46	3.22	1.44
4	1.20	0.00	5.25	57.30	0.00	-0.64	-27.51	-9.41
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	2.38	0.00	1.46	-0.64	0.00	4.16	-5.57	2.70
7	-4.53	0.00	3.22	-27.51	0.00	-5.57	69.01	4.61
8	25.45	0.00	1.44	-9.41	0.00	2.70	4.61	76.48

Signature Name: CLASS 15

Number of points =   2342

Band	1	2	3	4	5	6	7	8
Minimum	7	0	1	1	0	7	128	19
Mean	28.38	0.00	2.20	40.79	0.00	9.25	149.80	50.17
Standard	10.24	0.00	1.29	10.18	0.00	1.97	12.04	11.45
Maximum	66	0	7	68	0	14	175	81

Covariance Matrix

1	104.84	0.00	-0.14	-38.92	0.00	-1.69	3.73	31.88
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	-0.14	0.00	1.66	5.05	0.00	-0.81	7.78	-2.82
4	-38.92	0.00	5.05	103.60	0.00	-0.25	-25.50	-28.10
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	-1.69	0.00	-0.81	-0.25	0.00	3.89	-14.28	0.28
7	3.73	0.00	7.78	-25.50	0.00	-14.28	144.92	-7.23
8	31.88	0.00	-2.82	-28.10	0.00	0.28	-7.23	131.22

Signature Name: CLASS 16

Number of points =   1759

Band	1	2	3	4	5	6	7	8
Minimum	0	0	1	29	0	6	78	43
Mean	36.80	0.02	2.98	55.94	0.01	9.88	125.60	65.30
Standard	12.15	0.86	2.35	11.59	0.24	2.32	11.57	11.80
Maximum	81	36	19	87	10	17	149	112

Covariance Matrix

1	147.70	-0.75	2.53	-15.01	-0.21	-6.52	-5.16	29.57
2	-0.75	0.74	0.33	0.23	0.20	0.15	0.25	0.65
3	2.53	0.33	5.53	15.27	0.09	-1.28	-12.53	6.02
4	-15.01	0.23	15.27	134.42	0.06	-10.82	-58.17	7.29
5	-0.21	0.20	0.09	0.06	0.06	0.04	0.07	0.18
6	-6.52	0.15	-1.28	-10.82	0.04	5.36	-5.03	-1.22
7	-5.16	0.25	-12.53	-58.17	0.07	-5.03	133.85	-14.47
8	29.57	0.65	6.02	7.29	0.18	-1.22	-14.47	139.17

Signature Name: CLASS 17

Number of points =   4576

Band	1	2	3	4	5	6	7	8
Minimum	13	42	2	29	19	7	197	0
Mean	56.66	58.07	8.13	53.28	61.22	14.12	232.19	30.48
Standard	17.64	5.42	4.50	10.03	16.79	6.28	13.54	17.84
Maximum	127	72	25	85	103	46	254	136

Covariance Matrix

1	311.03	-54.31	7.91	-71.20	-190.92	18.58	-10.31	107.17
2	-54.31	29.39	4.77	34.98	82.44	8.49	7.84	-25.85
3	7.91	4.77	20.21	21.36	7.25	26.39	-43.88	11.56
4	-71.20	34.98	21.36	100.56	87.04	30.97	-38.26	-6.96
5	-190.92	82.44	7.25	87.04	281.83	11.81	15.72	-107.81
6	18.58	8.49	26.39	30.97	11.81	39.43	-47.45	13.98
7	-10.31	7.84	-43.88	-38.26	15.72	-47.45	183.26	-41.00
8	107.17	-25.85	11.56	-6.96	-107.81	13.98	-41.00	318.44

Signature Name: CLASS 18

Number of points = 1329

Band	1	2	3	4	5	6	7	8
Minimum	33	0	1	0	0	7	103	42
Mean	63.43	0.00	2.11	24.79	0.00	8.17	151.60	89.82
Standard	20.68	0.00	1.14	13.18	0.00	1.50	10.46	23.32
Maximum	127	0	8	55	0	14	170	159

Covariance Matrix

1	427.53	0.00	-3.05	-120.28	0.00	-10.06	5.33	53.25
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	-3.05	0.00	1.30	4.75	0.00	0.02	1.64	-6.02
4	-120.28	0.00	4.75	173.69	0.00	5.78	-54.58	-4.14
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	-10.06	0.00	0.02	5.78	0.00	2.25	-5.38	-3.53
7	5.33	0.00	1.64	-54.58	0.00	-5.38	109.47	9.52
8	53.25	0.00	-6.02	-4.14	0.00	-3.53	9.52	543.93

Signature Name: CLASS 19

Number of points = 2832

Band	1	2	3	4	5	6	7	8
Minimum	20	29	3	33	4	5	79	19
Mean	70.58	47.89	14.77	72.39	40.99	16.60	142.26	69.24
Standard	21.32	8.07	7.75	15.90	11.20	7.64	20.92	18.60
Maximum	157	71	70	135	82	67	210	135

Covariance Matrix

1	454.45	38.11	37.32	67.06	-37.32	47.18	130.20	34.00
2	38.11	65.05	13.08	62.46	44.96	20.01	88.50	13.62
3	37.32	13.08	60.03	32.68	5.14	40.14	-2.68	17.70
4	67.06	62.46	32.68	252.87	1.47	29.40	60.34	49.66
5	-37.32	44.96	5.14	1.47	125.45	11.29	5.05	25.88
6	47.18	20.01	40.14	29.40	11.29	58.37	7.19	27.91
7	130.20	88.50	-2.68	60.34	5.05	7.19	437.57	-24.98
8	34.00	13.62	17.70	49.66	25.88	27.91	-24.98	345.87

Signature Name: CLASS 20

Number of points = 1775

Band	1	2	3	4	5	6	7	8
Minimum	0	0	0	0	0	0	11	67
Mean	67.82	44.20	21.98	93.42	36.52	21.66	87.35	125.03
Standard	33.33	10.75	13.68	27.89	16.37	12.20	22.89	28.47
Maximum	172	105	90	173	126	134	170	252

Covariance Matrix

1	1111.06	84.82	13.10	158.81	45.45	-8.94	83.59	41.46
2	84.82	115.52	26.60	173.28	104.99	24.15	1.04	43.17
3	13.10	26.60	187.21	71.29	63.47	112.77	-56.09	-31.88
4	158.81	173.28	71.29	777.84	37.12	12.71	-92.31	116.97
5	45.45	104.99	63.47	37.12	267.85	51.44	40.05	-29.50
6	-8.94	24.15	112.77	12.71	51.44	148.92	0.49	18.32
7	83.59	1.04	-56.09	-92.31	40.05	0.49	523.85	18.75
8	41.46	43.17	-31.88	116.97	-29.50	18.32	18.75	810.82

Signature Name: CLASS 21

Number of points = 4012

Band	1	2	3	4	5	6	7	8
Minimum	142	31	0	43	3	0	11	0
Mean	213.16	45.92	11.30	102.52	21.57	19.53	89.61	84.57
Standard	27.59	7.42	9.03	19.22	17.32	13.42	29.90	45.87
Maximum	253	84	187	180	124	84	161	254

Covariance Matrix

1	761.46	0.75	-2.82	-141.55	-45.12	41.33	-43.18	-358.44
2	0.75	55.07	9.44	-4.82	81.65	27.86	-33.83	-44.81
3	-2.82	9.44	81.48	1.42	27.51	92.25	20.41	9.05
4	-141.55	-4.82	1.42	369.30	-13.85	7.66	-110.42	149.46
5	-45.12	81.65	27.51	-13.85	300.03	32.27	111.34	72.25
6	41.33	27.86	92.25	7.66	32.27	180.14	3.71	-47.38
7	-43.18	-33.83	20.41	-110.42	111.34	3.71	893.96	-123.98
8	-358.44	-44.81	9.05	149.46	72.25	-47.38	-123.98	2103.86

Signature Name: CLASS 22

Number of points = 3223

Band	1	2	3	4	5	6	7	8
Minimum	66	30	0	33	2	1	25	0
Mean	117.76	43.59	17.16	82.14	39.30	18.14	108.83	21.41
Standard	26.03	9.41	10.44	25.68	16.32	7.77	29.81	19.23
Maximum	203	77	75	142	109	63	173	91

Covariance Matrix

1	677.45	145.11	-65.75	421.00	-37.15	32.52	246.25	144.58
2	145.11	88.47	-38.07	132.57	53.32	-1.15	147.01	73.15
3	-65.75	-38.07	108.96	-64.82	14.23	49.41	-229.25	-41.80
4	421.00	132.57	-64.82	659.51	-144.83	42.30	148.24	128.13
5	-37.15	53.32	14.23	-144.83	266.19	-10.28	8.48	11.31
6	32.52	-1.15	49.41	42.30	-10.28	60.44	-94.44	-8.18
7	246.25	147.01	-229.25	148.24	8.48	-94.44	888.78	138.97
8	144.58	73.15	-41.80	128.13	11.31	-8.18	138.97	369.78

Signature Name: CLASS 23

Number of points = 8211

Band	1	2	3	4	5	6	7	8
Minimum	13	39	2	42	16	5	122	0
Mean	49.23	60.24	15.05	79.05	65.07	21.09	167.09	33.72
Standard	13.52	6.71	5.44	12.30	13.24	7.49	15.55	14.13
Maximum	109	82	63	120	103	57	210	93

Covariance Matrix

1	182.82	3.86	11.26	2.23	-50.38	28.20	42.54	33.01
2	3.86	45.06	5.73	49.75	43.65	12.26	-0.29	19.47
3	11.26	5.73	29.64	14.33	0.00	25.01	18.06	10.53
4	2.23	49.75	14.33	151.31	-0.07	18.99	-28.18	27.44
5	-50.38	43.65	0.00	-0.07	175.40	1.03	-6.94	-4.43
6	28.20	12.26	25.01	18.99	1.03	56.13	60.13	29.05
7	42.54	-0.29	18.06	-28.18	-6.94	60.13	241.87	31.00
8	33.01	19.47	10.53	27.44	-4.43	29.05	31.00	199.57

Signature Name: CLASS 24

Number of points = 13523

Band	1	2	3	4	5	6	7	8
Minimum	0	31	1	58	15	5	131	0
Mean	12.22	43.21	10.20	73.08	41.94	13.21	152.56	4.38
Standard	6.13	4.84	2.83	7.68	9.53	3.62	9.90	5.55
Maximum	46	65	26	114	75	41	195	48

Covariance Matrix

1	37.52	11.10	4.31	-6.83	4.94	5.69	9.11	6.51
2	11.10	23.38	4.73	12.18	29.04	8.44	17.62	-0.45
3	4.31	4.73	7.98	9.90	-0.21	7.05	12.28	-1.88
4	-6.83	12.18	9.90	58.98	8.85	10.02	6.55	-7.67
5	4.94	29.04	-0.21	8.85	90.90	8.46	12.70	-1.77
6	5.69	8.44	7.05	10.02	8.46	13.13	21.38	-2.43
7	9.11	17.62	12.28	6.55	12.70	21.38	98.01	-3.85
8	6.51	-0.45	-1.88	-7.67	-1.77	-2.43	-3.85	30.80

Signature Name: CLASS 25

Number of points = 4788

Band	1	2	3	4	5	6	7	8
Minimum	0	31	3	40	6	5	82	0
Mean	29.77	42.65	10.55	71.99	42.04	11.38	130.24	20.08
Standard	14.57	5.81	4.78	9.61	9.49	3.26	11.06	13.07
Maximum	81	67	39	113	76	35	159	64

Covariance Matrix

1	212.14	1.41	14.42	-17.42	2.66	10.05	-57.03	-1.44
2	1.41	33.73	-1.79	16.23	31.76	6.78	-3.24	5.51
3	14.42	-1.79	22.89	18.33	-2.26	9.88	-7.94	-4.76
4	-17.42	16.23	18.33	92.44	11.04	16.42	-15.34	-5.44
5	2.66	31.76	-2.26	11.04	90.11	6.87	-18.49	-3.30
6	10.05	6.78	9.88	16.42	6.87	10.61	-3.84	-0.86
7	-57.03	-3.24	-7.94	-15.34	-18.49	-3.84	122.40	-3.44
8	-1.44	5.51	-4.76	-5.44	-3.30	-0.86	-3.44	170.82

Signature Name: CLASS 26

Number of points = 5741

Band	1	2	3	4	5	6	7	8
Minimum	28	38	4	43	18	4	94	0
Mean	82.48	66.80	17.73	100.61	72.62	23.83	140.27	53.37
Standard	22.46	7.95	9.85	12.43	18.67	11.40	13.72	19.98
Maximum	165	95	79	150	177	133	194	140

Covariance Matrix

1	504.61	-30.52	-53.09	-92.67	90.68	-20.84	67.14	-60.15
2	-30.52	63.15	-4.49	21.46	83.27	25.74	13.11	-19.75
3	-53.09	-4.49	97.03	-15.31	-16.50	61.09	-33.43	42.93
4	-92.67	21.46	-15.31	154.52	-11.53	-23.96	-39.41	1.71
5	90.68	83.27	-16.50	-11.53	348.60	11.37	23.80	-22.39
6	-20.84	25.74	61.09	-23.96	11.37	129.88	13.50	3.35
7	67.14	13.11	-33.43	-39.41	23.80	13.50	188.16	-17.93
8	-60.15	-19.75	42.93	1.71	-22.39	3.35	-17.93	399.22

Signature Name: CLASS 27

Number of points = 2748

Band	1	2	3	4	5	6	7	8
Minimum	0	31	0	53	4	0	11	27
Mean	11.95	43.73	13.64	91.68	26.57	20.39	91.09	60.54
Standard	14.47	7.19	7.00	13.24	12.59	11.37	13.21	21.78
Maximum	59	72	55	145	81	68	144	132

Covariance Matrix

1	209.51	-43.82	22.08	-21.90	109.77	-61.09	8.95	9.53
2	-43.82	51.76	5.31	36.54	-1.72	51.60	-26.98	-24.63
3	22.08	5.31	48.98	19.58	32.63	40.85	-30.20	5.64
4	-21.90	36.54	19.58	175.29	17.21	36.81	-92.90	19.81
5	109.77	-1.72	32.63	17.21	158.54	1.74	-19.61	-1.91
6	-61.09	51.60	40.85	36.81	1.74	129.24	-63.86	-17.90
7	8.95	-26.98	-30.20	-92.90	-19.61	-63.86	174.55	-21.68
8	9.53	-24.63	5.64	19.81	-1.91	-17.90	-21.68	474.44

Signature Name: CLASS 28

Number of points = 16140

Band	1	2	3	4	5	6	7	8
Minimum	5	46	2	42	29	7	161	0
Mean	19.77	61.02	12.02	76.89	77.01	18.11	202.76	7.07
Standard	8.66	5.60	4.36	8.82	11.55	6.62	15.94	7.60
Maximum	65	77	28	106	114	51	249	66

Covariance Matrix

1	74.97	7.68	19.74	4.86	-18.87	28.75	-9.78	29.32
2	7.68	31.31	4.08	29.84	41.55	6.08	42.98	4.96
3	19.74	4.08	19.00	15.46	-11.01	24.89	-18.06	8.04
4	4.86	29.84	15.46	77.73	11.04	17.36	20.58	-5.91
5	-18.87	41.55	-11.01	11.04	133.34	-15.96	48.68	-5.16
6	28.75	6.08	24.89	17.36	-15.96	43.79	-16.08	10.11
7	-9.78	42.98	-18.06	20.58	48.68	-16.08	254.08	-13.26
8	29.32	4.96	8.04	-5.91	-5.16	10.11	-13.26	57.81

Signature Name: CLASS 29

Number of points = 24735

Band	1	2	3	4	5	6	7	8
Minimum	5	46	2	52	33	6	137	0
Mean	17.90	61.85	15.96	95.41	73.19	19.42	160.05	5.29
Standard	8.51	7.16	4.36	11.15	11.73	4.33	7.44	6.91
Maximum	52	83	42	126	113	59	190	50

Covariance Matrix

1	72.49	18.86	-2.56	1.78	-25.27	8.28	17.29	22.72
2	18.86	51.25	8.18	50.39	10.73	7.70	0.95	16.52
3	-2.56	8.18	18.99	29.01	-0.11	9.93	-2.19	-3.71
4	1.78	50.39	29.01	124.39	-28.64	13.98	-18.14	-3.72
5	-25.27	10.73	-0.11	-28.64	137.68	-3.22	-3.97	4.18
6	8.28	7.70	9.93	13.98	-3.22	18.73	2.44	2.84
7	17.29	0.95	-2.19	-18.14	-3.97	2.44	55.31	4.50
8	22.72	16.52	-3.71	-3.72	4.18	2.84	4.50	47.70

Signature Name: CLASS 30

Number of points =   10160

Band	1	2	3	4	5	6	7	8
Minimum	5	43	2	40	54	7	85	0
Mean	16.13	56.84	11.89	88.67	80.83	15.12	128.60	9.60
Standard	9.64	6.09	5.38	10.19	10.67	3.92	12.73	11.13
Maximum	59	78	41	119	133	52	158	73

Covariance Matrix

1	93.01	25.98	17.45	-11.78	15.08	1.85	-16.18	64.23
2	25.98	37.06	18.26	27.64	36.45	4.59	-3.70	25.57
3	17.45	18.26	28.93	28.36	10.56	9.57	-1.38	14.40
4	-11.78	27.64	28.36	103.93	6.82	17.57	-41.44	2.10
5	15.08	36.45	10.56	6.82	113.95	-0.91	4.80	20.99
6	1.85	4.59	9.57	17.57	-0.91	15.35	2.10	-0.59
7	-16.18	-3.70	-1.38	-41.44	4.80	2.10	161.96	-23.09
8	64.23	25.57	14.40	2.10	20.99	-0.59	-23.09	123.84

Signature Name: CLASS 31

Number of points =   3623

Band	1	2	3	4	5	6	7	8
Minimum	0	32	5	63	21	6	36	0
Mean	48.25	54.76	32.85	113.69	58.97	23.70	81.02	40.94
Standard	16.72	10.89	13.41	14.36	15.80	10.59	18.27	18.79
Maximum	97	104	86	153	117	72	128	94

Covariance Matrix

1	279.52	-62.95	26.33	-73.41	-108.90	5.41	-50.26	-15.05
2	-62.95	118.58	-24.19	81.25	118.86	1.35	123.48	37.02
3	26.33	-24.19	179.94	-31.88	-17.63	96.20	-70.09	-11.48
4	-73.41	81.25	31.88	206.32	59.16	27.64	31.66	53.79
5	-108.90	118.86	-17.63	59.16	249.49	-0.79	112.65	3.12
6	5.41	1.35	96.20	27.64	-0.79	112.08	6.25	15.63
7	-50.26	123.48	-70.09	31.66	112.65	6.25	333.88	79.80
8	-15.05	37.02	-11.48	53.79	3.12	15.63	79.80	353.15

Signature Name: CLASS 32

Number of points =   2716

Band	1	2	3	4	5	6	7	8
Minimum	0	29	3	84	6	3	49	0
Mean	7.86	44.09	22.14	117.16	30.41	22.51	85.69	10.34
Standard	7.09	6.75	10.44	14.97	9.19	9.80	12.96	11.70
Maximum	49	67	58	153	58	79	125	44

Covariance Matrix

1	50.23	-6.56	3.37	-4.45	27.08	-17.63	-0.53	21.87
2	-6.56	45.52	-24.76	-27.18	-0.19	16.34	-19.85	30.62
3	3.37	-24.76	109.00	97.96	-9.42	21.25	4.74	-33.86
4	-4.45	-27.18	97.96	223.97	-9.94	-10.62	-6.74	-78.76
5	27.08	-0.19	-9.42	-9.94	84.52	-19.75	-14.12	-0.53
6	-17.63	16.34	21.25	-10.62	-19.75	96.12	-17.68	20.97
7	-0.53	-19.85	4.74	-6.74	-14.12	-17.68	168.06	-32.46
8	21.87	30.62	-33.86	-78.76	-0.53	20.97	-32.46	136.93

Signature Name: CLASS 33

Number of points = 3495

Band	1	2	3	4	5	6	7	8
Minimum	0	0	0	102	0	0	11	0
Mean	27.18	50.24	28.28	147.24	26.93	15.43	40.73	25.79
Standard	16.32	9.82	22.28	14.33	15.81	10.15	9.68	19.69
Maximum	104	95	112	187	78	57	74	97

Covariance Matrix

1	266.29	-4.76	-55.37	13.52	-49.57	-8.69	7.39	65.21
2	-4.76	96.39	1.84	37.11	92.86	4.81	-4.40	3.51
3	-55.37	1.84	496.28	-142.12	119.74	167.43	-47.19	145.10
4	13.52	37.11	-142.12	205.33	-67.54	-67.08	-16.25	-73.44
5	-49.57	92.86	119.74	-67.54	249.85	71.78	-3.26	33.66
6	-8.69	4.81	167.43	-67.08	71.78	103.04	1.29	48.23
7	7.39	-4.40	-47.19	-16.25	-3.26	1.29	93.73	-36.95
8	65.21	3.51	145.10	-73.44	33.66	48.23	-36.95	387.55

Signature Name: CLASS 34

Number of points = 16644

Band	1	2	3	4	5	6	7	8
Minimum	0	5	0	164	2	0	3	0
Mean	17.76	45.94	6.47	209.00	11.80	8.80	44.68	6.41
Standard	10.58	12.75	4.78	15.25	5.21	6.10	12.87	9.60
Maximum	59	88	40	253	56	37	70	72

Covariance Matrix

1	111.90	18.14	-6.37	-4.65	-12.91	-0.92	-21.16	37.82
2	18.14	162.44	28.50	-57.12	3.53	-8.23	67.12	-23.91
3	-6.37	28.50	22.89	-20.39	8.94	14.31	20.14	-8.02
4	-4.65	-57.12	-20.39	232.70	-15.82	19.44	-27.24	-0.51
5	-12.91	3.53	8.94	-15.82	27.12	6.99	-5.99	-0.75
6	-0.92	-8.23	14.31	19.44	6.99	37.23	-2.34	2.55
7	-21.16	67.12	20.14	-27.24	-5.99	-2.34	165.54	-25.40
8	37.82	-23.91	-8.02	-0.51	-0.75	2.55	-25.40	92.08

Signature Name: CLASS 35

Number of points = 8520

Band	1	2	3	4	5	6	7	8
Minimum	4	50	6	120	45	0	25	0
Mean	14.22	77.32	34.94	157.32	87.08	20.74	72.43	5.97
Standard	8.12	6.94	10.03	9.59	12.15	6.85	12.28	7.98
Maximum	59	105	86	195	125	59	101	54

Covariance Matrix

1	65.86	6.73	6.24	-7.18	8.75	10.32	1.95	32.54
2	6.73	48.19	-2.99	20.96	49.19	-12.27	-13.07	-2.52
3	6.24	-2.99	100.52	-32.26	-7.80	19.09	-11.67	17.70
4	-7.18	20.96	-32.26	91.89	15.03	-21.10	7.22	-14.81
5	8.75	49.19	-7.80	15.03	147.51	-8.54	1.89	-4.37
6	10.32	-12.27	19.09	-21.10	-8.54	46.96	21.40	8.04
7	1.95	-13.07	-11.67	7.22	1.89	21.40	150.78	-12.73
8	32.54	-2.52	17.70	-14.81	-4.37	8.04	-12.73	63.66

Signature Name: CLASS 36

Number of points = 6115

Band	1	2	3	4	5	6	7	8
Minimum	0	39	6	90	30	6	56	0
Mean	17.26	60.60	28.55	126.14	59.28	22.24	94.70	7.96
Standard	8.96	5.09	9.99	9.69	8.22	6.75	11.96	8.17
Maximum	54	82	80	163	84	67	123	58

Covariance Matrix

1	80.34	5.95	2.05	-19.57	11.10	-6.04	-0.76	20.27
2	5.95	25.88	9.46	17.71	5.88	8.29	1.20	3.15
3	2.05	9.46	99.88	40.14	-28.16	7.77	11.51	10.64
4	-19.57	17.71	40.14	93.93	-22.87	12.73	-12.04	-9.88
5	11.10	5.88	-28.16	-22.87	67.59	-4.43	-27.54	7.05
6	-6.04	8.29	7.77	12.73	-4.43	45.56	1.66	2.34
7	-0.76	1.20	11.51	-12.04	-27.54	1.66	142.92	-1.10
8	20.27	3.15	10.64	-9.88	.7.05	2.34	-1.10	66.70

Signature Name: CLASS 37

Number of points = 2871

Band	1	2	3	4	5	6	7	. 8
Minimum	0	6	22	79	3	0	8	0
Mean	7.64	39.24	56.30	169.54	26.05	41.28	55.17	4.69
Standard	7.42	11.24	23.04	18.87	10.23	21.43	20.97	8.96
Maximum	66	77	170	234	70	126	121	50

Covariance Matrix

1	55.12	15.94	18.21	-7.47	-8.29	19.94	14.86	26.77
2	15.94	126.38	57.05	-61.10	56.81	-17.52	4.31	45.32
3	18.21	57.05	530.87	-119.27	5.46	163.57	-33.24	61.12
4	-7.47	-61.10	-119.27	355.92	-33.42	105.32	-48.79	-37.53
5	-8.29	56.81	5.46	-33.42	104.55	-19.33	-18.60	15.98
6	19.94	-17.52	163.57	105.32	-19.33	459.42	48.67	16.53
7	14.86	4.31	-33.24	-48.79	-18.60	48.67	439.55	-16.11
8	26.77	45.32	61.12	-37.53	15.98	16.53	-16.11	80.36

Signature Name: CLASS 38

Number of points = 5900

Band	1	2	3	4	5	6	7	8
Minimum	4	19	0	147	2	0	78	0
Mean	21.72	43.35	11.14	179.18	17.97	13.75	115.37	3.81
Standard	13.28	6.88	7.48	10.29	10.32	7.40	11.45	7.13
Maximum	54	67	49	217	52	84	145	73

Covariance Matrix

1	176.45	-2.89	10.16	9.52	0.44	13.02	47.93	9.35
2	-2.89	47.33	-0.84	7.04	46.15	11.43	-17.75	2.23
3	10.16	-0.84	55.94	-26.47	30.94	34.16	-23.23	0.30
4	9.52	7.04	-26.47	105.91	-7.59	8.50	-17.44	5.41
5	0.44	46.15	30.94	-7.59	106.49	31.12	-47.35	2.65
6	13.02	11.43	34.16	8.50	31.12	54.79	-20.02	2.44
7	47.93	-17.75	-23.23	-17.44	-47.35	-20.02	131.18	-6.21
8	9.35	2.23	0.30	5.41	2.65	2.44	-6.21	50.80

Signature Name: CLASS 39

Number of points = 32244

Band	1	2	3	4	5	6	7	8
Minimum	2	10	0	188	2	0	43	0
Mean	27.28	48.90	4.25	221.77	9.67	8.48	71.21	4.95
Standard	10.72	7.72	4.74	10.42	4.60	7.69	12.40	6.20
Maximum	66	84	31	247	56	44	109	62

Covariance Matrix

1	114.83	0.37	-4.41	-13.59	-15.27	5.20	0.23	12.14
2	0.37	59.56	15.32	-30.65	10.16	3.28	2.75	-6.57
3	-4.41	15.32	22.48	-13.69	9.41	27.56	-0.34	-1.07
4	-13.59	-30.65	-13.69	108.57	-0.07	6.44	-37.14	6.17
5	-15.27	10.16	9.41	-0.07	21.16	13.52	5.48	1.88
6	5.20	3.28	27.56	6.44	13.52	59.14	-5.92	1.79
7	0.23	2.75	-0.34	-37.14	5.48	-5.92	153.84	-3.32
8	12.14	-6.57	-1.07	6.17	1.88	1.79	-3.32	38.47

Signature Name: CLASS 40

Number of points = 7146

Band	1	2	3	4	5	6	7	8
Minimum	0	52	4	95	61	6	64	0
Mean	11.53	67.95	27.42	131.11	80.04	22.01	99.79	4.12
Standard	5.31	5.05	7.00	10.44	8.49	5.64	9.62	7.03
Maximum	49	93	73	155	115	67	122	56

Covariance Matrix

1	28.24	1.43	2.74	-8.84	5.90	0.85	-2.23	17.26
2	1.43	25.50	14.68	29.49	14.62	2.57	5.49	-2.66
3	2.74	14.68	49.04	35.77	0.31	10.49	-1.42	6.32
4	-8.84	29.49	35.77	108.97	-5.78	5.51	-16.51	-18.43
5	5.90	14.62	0.31	-5.78	72.05	4.27	-0.16	6.96
6	0.85	2.57	10.49	5.51	4.27	31.77	-0.13	6.39
7	-2.23	5.49	-1.42	-16.51	-0.16	-0.13	92.59	-7.34
8	17.26	-2.66	6.32	-18.43	6.96	6.39	-7.34	49.44

Signature Name: CLASS 41

Number of points = 3851

Band	1	2	3	4	5	6	7	8
Minimum	4	23	3	119	4	2	105	0
Mean	12.81	46.43	8.38	160.05	27.85	6.27	134.43	1.96
Standard	7.98	5.03	4.26	7.99	11.74	4.31	10.73	3.90
Maximum	49	67	45	191	55	56	173	62

Covariance Matrix

1	63.74	-4.72	5.84	-13.10	1.58	13.68	25.76	9.60
2	-4.72	25.27	4.94	0.03	42.85	0.12	-17.07	-2.30
3	5.84	4.94	18.13	-9.35	17.81	11.10	-8.69	0.58
4	-13.10	0.03	-9.35	63.79	-25.42	-1.17	-23.57	-5.10
5	1.58	42.85	17.81	-25.42	137.72	-0.39	-14.00	-1.53
6	13.68	0.12	11.10	-1.17	-0.39	18.54	3.78	3.04
7	25.76	-17.07	-8.69	-23.57	-14.00	3.78	115.07	9.32
8	9.60	-2.30	0.58	-5.10	-1.53	3.04	9.32	15.22

Signature Name: CLASS 42

Number of points =   6272

Band	1	2	3	4	5	6	7	8
Minimum	5	32	4	108	13	2	112	0
Mean	23.18	55.77	14.64	137.63	58.63	14.26	138.85	3.80
Standard	10.82	5.23	4.31	9.54	11.23	8.20	9.94	5.41
Maximum	62	76	45	171	89	69	172	52

Covariance Matrix

1	117.10	20.07	10.36	-7.44	-16.99	27.75	-32.18	19.11
2	20.07	27.32	5.00	-4.24	16.98	20.17	-9.31	2.18
3	10.36	5.00	18.58	-12.18	-7.03	20.50	-9.99	0.21
4	-7.44	-4.24	-12.18	91.06	23.85	-25.40	-37.65	-1.44
5	-16.99	16.98	-7.03	23.85	126.04	-15.14	-18.39	-2.27
6	27.75	20.17	20.50	-25.40	-15.14	67.29	-7.81	2.22
7	-32.18	-9.31	-9.99	-37.65	-18.39	-7.81	98.74	-4.61
8	19.11	2.18	0.21	-1.44	-2.27	2.22	-4.61	29.27

Signature Name: CLASS 43

Number of points =   12059

Band	1	2	3	4	5	6	7	8
Minimum	28	26	0	149	2	0	9	0
Mean	61.92	52.71	10.67	200.39	14.70	17.74	63.61	16.01
Standard	13.63	10.99	7.02	13.60	8.88	10.18	17.76	13.01
Maximum	124	96	53	237	53	69	107	58

Covariance Matrix

1	185.85	-2.46	-0.67	-16.92	10.15	9.21	-36.94	16.10
2	-2.46	120.85	36.96	-16.99	73.44	35.22	-40.86	-27.43
3	-0.67	36.96	49.34	-16.34	29.41	53.50	-1.34	-18.40
4	-16.92	-16.99	-16.34	185.02	-22.55	21.63	-6.34	-9.23
5	10.15	73.44	29.41	-22.55	78.94	31.99	-21.34	-10.04
6	9.21	35.22	53.50	21.63	31.99	103.69	-12.68	-32.57
7	-36.94	-40.86	-1.34	-6.34	-21.34	-12.68	315.46	12.98
8	16.10	-27.43	-18.40	-9.23	-10.04	-32.57	12.98	169.28

Signature Name: CLASS 44

Number of points =   5888

Band	1	2	3	4	5	6	7	8
Minimum	36	28	0	103	2	0	86	0
Mean	71.64	42.60	8.53	153.45	10.40	15.77	126.25	11.85
Standard	12.31	5.97	3.99	18.80	5.93	8.97	11.77	14.50
Maximum	127	69	22	201	45	46	170	108

Covariance Matrix

1	151.54	16.12	-6.96	-74.36	-2.74	1.62	-19.83	50.33
2	16.12	35.66	8.49	-26.98	19.10	28.86	-7.47	-4.92
3	-6.96	8.49	15.89	5.50	7.67	23.66	6.22	-0.40
4	-74.36	-26.98	5.50	353.31	12.72	-62.05	-98.08	-48.00
5	-2.74	19.10	7.67	12.72	35.18	5.99	-9.91	0.80
6	1.62	28.86	23.66	-62.05	5.99	80.55	24.87	-9.21
7	-19.83	-7.47	6.22	-98.08	-9.91	24.87	138.46	19.35
8	50.33	-4.92	-0.40	-48.00	0.80	-9.21	19.35	210.11

Signature Name: CLASS 45

Number of points = 5083

Band	1	2	3	4	5	6	7	8
Minimum	4	46	0	138	41	0	78	0
Mean	16.32	64.40	18.61	161.75	74.65	14.96	112.83	3.31
Standard	10.98	6.10	6.17	10.38	12.12	8.14	11.70	4.74
Maximum	59	97	73	211	109	57	152	54

Covariance Matrix

1	120.49	3.77	-6.90	-4.21	4.55	39.13	15.55	16.57
2	3.77	37.16	6.09	17.04	42.33	20.64	-25.36	3.59
3	-6.90	6.09	38.04	-14.87	11.47	16.16	-23.78	-0.59
4	-4.21	17.04	-14.87	107.68	-26.75	22.64	-53.15	3.10
5	4.55	42.33	11.47	-26.75	146.81	2.61	-8.57	-1.95
6	39.13	20.64	16.16	22.64	2.61	66.28	-20.36	7.98
7	15.55	-25.36	-23.78	-53.15	-8.57	-20.36	137.01	-5.84
8	16.57	3.59	-0.59	3.10	-1.95	7.98	-5.84	22.42

Signature Name: CLASS 46

Number of points = 7355

Band	1	2	3	4	5	6	7	8
Minimum	10	46	0	130	22	0	52	0
Mean	55.13	70.53	21.37	169.23	57.17	27.70	97.50	15.89
Standard	14.68	9.54	6.87	14.09	13.40	10.55	13.39	14.35
Maximum	97	126	68	213	105	81	141	81

Covariance Matrix

1	215.36	-14.64	-8.27	-54.30	-23.93	-22.51	-28.68	5.62
2	-14.64	90.97	29.11	32.38	39.81	17.59	-35.56	-22.75
3	-8.27	29.11	47.26	23.55	5.29	44.36	-25.86	-8.26
4	-54.30	32.38	23.55	198.43	-29.97	34.06	-56.40	18.33
5	-23.93	39.81	5.29	-29.97	179.51	13.64	29.20	0.87
6	-22.51	17.59	44.36	34.06	13.64	111.32	19.89	8.17
7	-28.68	-35.56	-25.86	-56.40	29.20	19.89	179.32	-28.11
8	5.62	-22.75	-8.26	18.33	0.87	8.17	-28.11	205.93

Signature Name: CLASS 47

Number of points = 18960

Band	1	2	3	4	5	6	7	8
Minimum	5	45	4	74	29	8	107	0
Mean	19.13	66.92	27.57	118.53	66.52	23.98	139.67	4.78
Standard	9.73	6.93	8.10	9.14	9.58	7.84	9.17	6.77
Maximum	54	96	72	153	90	80	174	56

Covariance Matrix

1	94.70	1.52	19.43	-4.66	-29.07	-4.12	-8.72	24.13
2	1.52	48.02	-8.81	33.26	34.13	0.73	13.27	6.36
3	19.43	-8.81	65.54	2.12	-18.74	-6.25	-32.86	11.93
4	-4.66	33.26	2.12	83.56	15.55	19.67	-2.39	-3.34
5	-29.07	34.13	-18.74	15.55	91.70	-3.06	5.53	-3.36
6	-4.12	0.73	-6.25	19.67	-3.06	61.43	7.98	1.12
7	-8.72	13.27	-32.86	-2.39	5.53	7.98	84.02	-8.74
8	24.13	6.36	11.93	-3.34	-3.36	1.12	-8.74	45.78

Signature Name: CLASS 48

Number of points = 18341

Band	1	2	3	4	5	6	7	8
Minimum	5	55	4	94	73	5	100	0
Mean	17.68	73.23	23.33	131.74	98.01	20.54	131.48	3.71
Standard	9.09	6.56	6.37	8.87	10.66	5.63	9.03	5.33
Maximum	51	98	59	163	141	56	160	62

Covariance Matrix

1	82.56	18.79	-2.05	7.57	-4.40	7.68	-4.67	17.15
2	18.79	42.99	18.19	-8.01	15.16	7.85	-3.96	7.18
3	-2.05	18.19	40.56	8.36	-6.47	5.96	-21.98	4.37
4	7.57	-8.01	8.36	78.76	-4.09	-8.18	-29.40	-6.45
5	-4.40	15.16	-6.47	-4.09	113.67	-2.14	-4.70	2.42
6	7.68	7.85	5.96	-8.18	-2.14	31.72	8.17	2.23
7	-4.67	-3.96	-21.98	-29.40	-4.70	8.17	81.58	-2.55
8	17.15	7.18	4.37	-6.45	2.42	2.23	-2.55	28.38

Signature Name: CLASS 49

Number of points = 12235

Band	1	2	3	4	5	6	7	8
Minimum	4	60	6	100	77	5	68	0
Mean	17.66	83.35	34.54	149.98	110.45	24.71	102.42	5.68
Standard	7.96	8.62	8.18	10.96	12.78	9.34	12.17	7.84
Maximum	57	107	68	194	160	61	128	68

Covariance Matrix

1	63.30	26.22	5.73	6.30	19.96	21.99	28.17	26.30
2	26.22	74.23	44.38	16.37	52.28	11.69	36.91	18.82
3	5.73	44.38	66.86	-1.04	41.44	5.18	20.67	20.02
4	6.30	16.37	-1.04	120.10	-16.93	21.67	4.69	-21.47
5	19.96	52.28	41.44	-16.93	163.33	19.51	34.02	26.44
6	21.99	11.69	5.18	21.67	19.51	87.27	24.42	1.84
7	28.17	36.91	20.67	4.69	34.02	24.42	147.99	2.26
8	26.30	18.82	20.02	-21.47	26.44	1.84	2.26	61.52

Signature Name: CLASS 50

Number of points = 4159

Band	1	2	3	4	5	6	7	8
Minimum	20	37	3	94	9	4	102	0
Mean	64.05	61.64	15.25	132.90	45.93	36.30	143.04	7.24
Standard	13.33	7.43	4.31	12.47	17.83	12.44	12.30	10.48
Maximum	134	87	57	175	88	117	168	61

Covariance Matrix

1	177.71	-14.10	-19.39	-47.04	-5.93	-37.40	-20.52	8.73
2	-14.10	55.19	14.21	-1.95	104.07	37.61	-18.86	-4.05
3	-19.39	14.21	18.59	18.07	13.96	33.03	-17.49	-0.59
4	-47.04	-1.95	18.07	155.39	-32.35	76.60	-58.28	-12.44
5	-5.93	104.07	13.96	-32.35	317.97	45.60	-14.29	-7.35
6	-37.40	37.61	33.03	76.60	45.60	154.65	-24.71	-33.44
7	-20.52	-18.86	-17.49	-58.28	-14.29	-24.71	151.37	-23.90
8	8.73	-4.05	-0.59	-12.44	-7.35	-33.44	-23.90	109.89

Signature Name: CLASS 51

Number of points = 7558

Band	1	2	3	4	5	6	7	8
Minimum	7	62	6	88	71	6	109	0
Mean	24.62	81.35	26.28	127.88	113.16	44.25	148.44	8.96
Standard	12.53	5.95	6.67	9.72	13.73	20.20	15.41	11.19
Maximum	89	100	55	167	178	122	189	87

Covariance Matrix

1	156.93	26.80	-3.39	-18.45	19.19	17.33	-53.30	51.16
2	26.80	35.43	12.41	-4.49	29.13	11.86	-9.61	15.21
3	-3.39	12.41	44.54	19.13	-10.38	80.19	5.74	-1.06
4	-18.45	-4.49	19.13	94.53	-33.81	61.27	-40.85	-21.39
5	19.19	29.13	-10.38	-33.81	188.63	-105.25	-55.89	24.38
6	17.33	11.86	80.19	61.27	-105.25	407.93	120.67	-39.64
7	-53.30	-9.61	5.74	-40.85	-55.89	120.67	237.45	-42.03
8	51.16	15.21	-1.06	-21.39	24.38	-39.64	-42.03	125.19

Signature Name: CLASS 52

Number of points = 9007

Band	1	2	3	4	5	6	7	8
Minimum	8	56	5	72	48	5	121	0
Mean	42.70	75.43	22.05	105.20	87.07	40.17	169.45	24.95
Standard	14.18	5.21	7.40	11.26	11.57	11.63	15.89	13.80
Maximum	100	96	59	140	143	133	210	93

Covariance Matrix

1	201.17	-1.00	-35.92	6.84	-18.41	-18.13	-24.48	13.64
2	-1.00	27.18	-7.49	30.98	32.10	-3.19	-3.88	-4.68
3	-35.92	-7.49	54.78	-27.25	-5.64	61.81	-14.40	20.23
4	6.84	30.98	-27.25	126.73	19.04	-20.98	-35.97	-24.73
5	-18.41	32.10	-5.64	19.04	133.89	7.38	14.60	-16.71
6	-18.13	-3.19	61.81	-20.98	7.38	135.34	12.81	4.68
7	-24.48	-3.88	-14.40	-35.97	14.60	12.81	252.43	-8.88
8	13.64	-4.68	20.23	-24.73	-16.71	4.68	-8.88	190.48

Signature Name: CLASS 53

Number of points = 4343

Band	1	2	3	4.	5	6	7	8
Minimum	20	54	3	90	45	3	59	0
Mean	70.79	79.07	20.73	137.48	89.61	23.15	105.41	30.41
Standard	19.61	8.09	9.85	14.34	19.31	13.54	14.64	17.97
Maximum	140	107	65	188	168	117	167	97

Covariance Matrix

1	384.71	-21.66	10.22	45.74	43.09	17.02	-28.93	2.60
2	-21.66	65.44	13.23	3.77	35.92	10.83	-21.13	-12.00
3	10.22	13.23	96.94	-2.65	48.45	64.18	-25.02	4.88
4	45.74	3.77	-2.65	205.62	-41.00	8.21	-65.87	-26.08
5	43.09	35.92	48.45	-41.00	372.98	27.56	45.22	19.72
6	17.02	10.83	64.18	8.21	27.56	183.31	53.16	-7.31
7	-28.93	-21.13	-25.02	-65.87	45.22	53.16	214.43	-17.31
8	2.60	-12.00	4.88	-26.08	19.72	-7.31	-17.31	322.92

Signature Name: CLASS 54

Number of points = 5087

Band	1	2	3	4	5	6	7	8
Minimum	63	38	2	43	4	2	36	0
Mean	124.30	68.86	21.89	136.09	72.25	22.71	96.59	78.84
Standard	24.54	12.21	11.76	18.13	24.33	12.61	17.20	27.54
Maximum	195	116	89	196	157	90	171	188

Covariance Matrix

1	602.33	-23.55	-41.64	-101.63	3.26	18.22	52.70	-58.35
2	-23.55	149.02	28.19	18.62	171.02	13.71	-71.56	-76.79
3	-41.64	28.19	138.22	-9.92	65.30	83.38	-103.18	5.45
4	-101.63	18.62	-9.92	328.56	-64.44	46.94	-70.42	7.33
5	3.26	171.02	65.30	-64.44	592.11	22.31	-28.78	-112.12
6	18.22	13.71	83.38	46.94	22.31	159.13	-74.95	-3.18
7	52.70	-71.56	-103.18	-70.42	-28.78	-74.95	295.89	50.52
8	-58.35	-76.79	5.45	7.33	-112.12	-3.18	50.52	758.39

Signature Name: CLASS 55

Number of points = 7183

Band	1	2	3	4	5	6	7	8
Minimum	59	31	0	109	2	0	17	0
Mean	103.68	57.55	14.26	163.40	29.09	19.50	90.49	34.44
Standard	18.51	12.67	7.98	15.78	15.67	12.01	17.01	19.51
Maximum	180	113	70	209	80	90	173	107

Covariance Matrix

1	342.45	-13.06	-7.59	-73.48	-28.05	15.52	-30.70	4.46
2	-13.06	160.59	28.29	3.23	110.08	19.96	-48.88	-26.36
3	-7.59	28.29	63.61	-13.02	48.83	73.04	-7.66	-22.37
4	-73.48	3.23	-13.02	248.95	-66.41	2.02	-52.84	29.15
5	-28.05	110.08	48.83	-66.41	245.60	43.59	18.88	-31.38
6	15.52	19.96	73.04	2.02	43.59	144.19	-0.38	-12.21
7	-30.70	-48.88	-7.66	-52.84	18.88	-0.38	289.31	9.07
8	4.46	-26.36	-22.37	29.15	-31.38	-12.21	9.07	380.81

Signature Name: CLASS 56

Number of points = 5177

Band	1	2	3	4	5	6	7	8
Minimum	5	56	0	100	43	0	11	9
Mean	56.83	89.33	42.77	157.47	90.90	38.39	73.16	65.65
Standard	18.71	12.08	14.81	16.57	18.48	17.06	17.24	21.79
Maximum	115	138	109	225	152	111	127	154

Covariance Matrix

1	350.15	-26.53	-21.82	-58.10	-13.08	26.75	51.55	20.29
2	-26.53	145.94	17.05	32.86	42.45	20.13	-75.25	-21.45
3	-21.82	17.05	219.22	-27.20	68.42	86.62	-33.74	-40.80
4	-58.10	32.86	-27.20	274.71	-98.21	34.38	-30.91	-23.78
5	-13.08	42.45	68.42	-98.21	341.61	-29.69	52.06	-10.71
6	26.75	20.13	86.62	34.38	-29.69	291.15	27.74	-14.58
7	51.55	-75.25	-33.74	-30.91	52.06	27.74	297.11	8.29
8	20.29	-21.45	-40.80	-23.78	-10.71	-14.58	8.29	474.78

Signature Name: CLASS 57

Number of points = 4234

Band	1	2	3	4	5	6	7	8
Minimum	0	18	0	112	2	0	0	31
Mean	67.34	56.51	11.94	189.08	22.22	18.30	55.01	73.91
Standard	23.62	17.09	9.25	20.05	13.86	12.30	23.49	22.30
Maximum	150	117	106	253	81	75	118	170

Covariance Matrix

1	558.07	11.57	-19.60	-99.55	-47.27	-1.62	9.86	49.54
2	11.57	292.22	79.77	-48.47	165.27	94.66	70.17	-19.95
3	-19.60	79.77	85.53	-24.17	61.40	78.32	43.32	10.96
4	-99.55	-48.47	-24.17	402.16	-50.94	26.22	50.55	-6.66
5	-47.27	165.27	61.40	-50.94	192.00	74.73	27.69	16.27
6	-1.62	94.66	78.32	26.22	74.73	151.40	59.94	23.14
7	9.86	70.17	43.32	50.55	27.69	59.94	551.64	32.54
8	49.54	-19.95	10.96	-6.66	16.27	23.14	32.54	497.51

Signature Name: CLASS 58

Number of points = 7671

Band	1	2	3	4	5	6	7	8
Minimum	5	68	12	122	71	0	33	0
Mean	20.77	100.44	53.05	172.67	109.68	26.52	85.14	11.47
Standard	10.48	9.07	10.62	12.82	15.47	11.88	12.02	10.96
Maximum	89	126	109	225	159	83	113	62

Covariance Matrix

1	109.91	7.74	-2.45	-58.08	50.18	9.07	-27.76	59.93
2	7.74	82.29	17.52	21.03	4.36	-15.88	-19.21	19.60
3	-2.45	17.52	112.77	-0.40	-18.37	35.30	-9.74	11.88
4	-58.08	21.03	-0.40	164.25	-97.40	18.86	19.73	-38.79
5	50.18	4.36	-18.37	-97.40	239.42	-45.10	10.59	38.84
6	9.07	-15.88	35.30	18.86	-45.10	141.06	5.56	0.76
7	-27.76	-19.21	-9.74	19.73	10.59	5.56	144.39	-30.84
8	59.93	19.60	11.88	-38.79	38.84	0.76	-30.84	120.10

Signature Name: CLASS 59

Number of points = 8275

Band	1	2	3	4	5	6	7	8
Minimum	5	50	0	142	45	0	13	0
Mean	16.81	95.29	38.38	181.49	81.43	26.90	49.20	11.41
Standard	9.76	11.84	12.00	13.20	13.07	13.24	11.54	13.65
Maximum	66	139	89	229	129	74	95	75

Covariance Matrix

1	95.26	-7.32	-7.90	-8.45	-21.30	8.48	12.20	62.09
2	-7.32	140.30	54.47	-33.17	44.49	-9.08	-24.69	5.73
3	-7.90	54.47	144.10	-77.33	14.84	21.77	-40.60	11.22
4	-8.45	-33.17	-77.33	174.34	-31.91	45.69	46.18	-27.79
5	-21.30	44.49	14.84	-31.91	170.78	-27.42	-0.89	-24.35
6	8.48	-9.08	21.77	45.69	-27.42	175.21	12.52	12.16
7	12.20	-24.69	-40.60	46.18	-0.89	12.52	133.07	-25.98
8	62.09	5.73	11.22	-27.79	-24.35	12.16	-25.98	186.20

Signature Name: CLASS 60

Number of points =   9530

Band	1	2	3	4	5	6	7	8
Minimum	4	36	0	165	7	0	8	0
Mean	20.26	77.17	24.70	200.41	40.74	25.13	59.55	8.60
Standard	9.93	11.35	9.70	12.28	15.48	11.73	14.93	11.01
Maximum	62	127	70	244	97	69	107	73

Covariance Matrix

1	98.65	10.74	11.22	-31.59	-23.01	7.71	19.42	30.71
2	10.74	128.84	37.95	9.96	17.00	2.52	-22.60	14.01
3	11.22	37.95	94.02	-32.84	-18.85	54.29	-11.03	11.69
4	-31.59	9.96	-32.84	150.70	4.00	12.73	26.97	-22.60
5	-23.01	17.00	-18.85	4.00	239.62	23.57	50.48	2.78
6	7.71	2.52	54.29	12.73	23.57	137.67	17.99	23.51
7	19.42	-22.60	-11.03	26.97	50.48	17.99	222.94	-13.94
8	30.71	14.01	11.69	-22.60	2.78	23.51	-13.94	121.18

Signature Name: CLASS 61

Number of points =   15091

Band	1	2	3	4	5	6	7	8
Minimum	1	4	0	194	2	0	1	0
Mean	24.24	52.21	15.28	232.43	17.72	38.85	40.00	5.64
Standard	11.61	11.46	7.55	8.64	8.63	12.53	14.26	6.73
Maximum	69	100	65	254	69	76	83	75

Covariance Matrix

1	134.78	3.57	-23.14	-20.56	-16.32	-20.71	-20.27	25.15
2	3.57	131.36	26.90	-31.29	27.33	17.27	6.84	-6.68
3	-23.14	26.90	57.04	-26.51	20.18	58.03	-9.16	-1.42
4	-20.56	-31.29	-26.51	74.72	2.09	-10.48	-15.29	0.84
5	-16.32	27.33	20.18	2.09	74.46	28.99	-40.23	-0.14
6	-20.71	17.27	58.03	-10.48	28.99	157.02	0.25	-5.26
7	-20.27	6.84	-9.16	-15.29	-40.23	0.25	203.28	-24.52
8	25.15	-6.68	-1.42	0.84	-0.14	-5.26	-24.52	45.23

Signature Name: CLASS 62

Number of points =   7124

Band	1	2	3	4	5	6	7	8
Minimum	5	61	37	155	17	0	11	0
Mean	13.77	107.54	69.10	200.57	62.94	38.28	54.37	6.04
Standard	10.43	8.73	12.82	8.10	12.80	13.25	15.55	8.40
Maximum	66	137	117	231	123	77	93	56

Covariance Matrix

1	108.80	24.75	56.15	-22.87	14.52	0.12	-69.58	53.70
2	24.75	76.30	26.88	-4.43	9.01	-7.73	-29.36	10.63
3	56.15	26.88	164.43	19.74	6.23	19.68	-87.04	25.58
4	-22.87	-4.43	19.74	65.67	-33.93	2.59	-17.05	-17.68
5	14.52	9.01	6.23	-33.93	163.78	-7.06	33.57	7.12
6	0.12	-7.73	19.68	2.59	-7.06	175.48	-28.25	0.21
7	-69.58	-29.36	-87.04	-17.05	33.57	-28.25	241.73	-34.50
8	53.70	10.63	25.58	-17.68	7.12	0.21	-34.50	70.48

Signature Name: CLASS 63

Number of points = 4828

Band	1	2	3	4	5	6	7	8
Minimum	4	31	16	125	17	37	49	0
Mean	18.53	79.66	46.41	179.53	82.56	73.46	99.93	9.58
Standard	13.49	9.37	15.05	16.95	13.79	22.71	16.83	13.19
Maximum	97	109	102	228	133	162	144	68

Covariance Matrix

1	182.09	18.51	32.20	-66.31	17.65	54.74	-7.56	86.98
2	18.51	87.75	0.33	-18.94	44.36	21.90	4.57	4.99
3	32.20	0.33	226.37	-23.01	-5.32	101.57	-94.37	29.69
4	-66.31	-18.94	-23.01	287.45	-51.30	-186.67	-173.22	-65.67
5	17.65	44.36	-5.32	-51.30	190.20	84.60	55.45	0.60
6	54.74	21.90	101.57	-186.67	84.60	515.70	155.35	72.04
7	-7.56	4.57	-94.37	-173.22	55.45	155.35	283.21	1.86
8	86.98	4.99	29.69	-65.67	0.60	72.04	1.86	174.09

Signature Name: CLASS 64

Number of points = 6687

Band	1	2	3	4	5	6	7	8
Minimum	13	44	0	147	13	0	1	0
Mean	61.53	80.41	31.09	205.62	50.67	49.60	35.24	15.89
Standard	14.07	10.97	9.54	13.64	13.87	13.10	13.00	14.83
Maximum	113	134	87	239	99	90	81	77

Covariance Matrix

1	197.91	-5.70	-4.80	-71.02	0.34	-15.32	18.85	-27.87
2	-5.70	120.28	50.71	-28.03	78.31	4.21	-2.68	34.54
3	-4.80	50.71	91.06	-33.84	34.12	40.10	-27.69	28.90
4	-71.02	-28.03	-33.84	186.14	-0.14	52.26	-64.55	-43.09
5	0.34	78.31	34.12	-0.14	192.32	35.14	-23.60	44.08
6	-15.32	4.21	40.10	52.26	35.14	171.67	-36.06	-16.33
7	18.85	-2.68	-27.69	-64.55	-23.60	-36.06	168.98	-34.22
8	-27.87	34.54	28.90	-43.09	44.08	-16.33	-34.22	219.90

Signature Name: CLASS 65

Number of points = 8465

Band	1	2	3	4	5	6	7	8
Minimum	5	38	0	165	14	0	1	0
Mean	18.20	100.10	50.09	221.54	62.54	58.85	25.85	8.12
Standard	8.80	12.03	13.82	10.26	13.66	12.18	11.87	10.08
Maximum	65	144	91	251	103	92	74	60

Covariance Matrix

1	77.46	-6.84	4.47	-5.12	21.06	7.79	-22.37	36.84
2	-6.84	144.80	70.09	5.03	7.51	40.74	-13.48	-5.28
3	4.47	70.09	190.87	-10.40	-0.75	69.75	-16.99	0.22
4	-5.12	5.03	-10.40	105.17	9.46	-2.43	-62.78	-6.29
5	21.06	7.51	-0.75	9.46	186.60	7.02	10.96	-5.43
6	7.79	40.74	69.75	-2.43	7.02	148.40	-6.30	3.56
7	-22.37	-13.48	-16.99	-62.78	10.96	-6.30	140.81	-23.55
8	36.84	-5.28	0.22	-6.29	-5.43	3.56	-23.55	101.59

Signature Name: CLASS 66

Number of points =   1773

Band	1	2	3	4	5	6	7	8
Minimum	0	9	94	83	7	0	0	0
Mean	16.13	84.37	171.83	223.56	48.31	1.86	16.29	21.62
Standard	12.44	28.75	33.84	17.29	22.42	7.74	10.33	22.83
Maximum	97	131	253	238	119	50	48	112

Covariance Matrix

1	154.63	169.93	2.97	-33.25	83.52	-0.82	24.29	204.59
2	169.93	826.38	101.71	91.63	374.35	-50.91	64.33	236.03
3	2.97	101.71	1145.07	9.61	34.94	-13.36	-33.13	30.15
4	-33.25	91.63	9.61	299.04	76.10	-86.82	-34.11	-95.57
5	83.52	374.35	34.94	76.10	502.83	-43.21	83.43	129.45
6	-0.82	-50.91	-13.36	-86.82	-43.21	59.98	-4.87	8.22
7	24.29	64.33	-33.13	-34.11	83.43	-4.87	106.64	9.68
8	204.59	236.03	30.15	-95.57	129.45	8.22	9.68	521.43

Signature Name: CLASS 67

Number of points =   9539

Band	1	2	3	4	5	6	7	8
Minimum	5	6	0	174	3	44	0	0
Mean	20.68	60.72	36.81	232.55	36.90	81.95	31.96	7.07
Standard	11.60	14.64	12.18	8.51	13.68	15.19	12.99	8.70
Maximum	66	105	112	254	81	134	81	67

Covariance Matrix

1	134.59	18.76	-33.67	-15.95	35.93	-15.02	-9.11	36.07
2	18.76	214.38	-31.16	-9.87	67.41	-14.63	39.46	11.72
3	-33.67	-31.16	148.30	-27.04	-21.79	32.19	-44.16	5.20
4	-15.95	-9.87	-27.04	72.49	10.73	12.47	-4.13	-16.06
5	35.93	67.41	-21.79	10.73	187.08	1.89	25.13	-2.72
6	-15.02	-14.63	32.19	12.47	1.89	230.71	15.34	-11.16
7	-9.11	39.46	-44.16	-4.13	25.13	15.34	168.67	-13.52
8	36.07	11.72	5.20	-16.06	-2.72	-11.16	-13.52	75.66

Signature Name: CLASS 68

Number of points =   7705

Band	1	2	3	4	5	6	7	8
Minimum	33	54	26	165	17	45	1	0
Mean	65.30	95.93	54.55	211.37	63.04	87.75	21.31	14.70
Standard	12.24	9.11	11.53	7.38	14.71	14.44	9.86	11.90
Maximum	120	132	102	238	111	121	76	59

Covariance Matrix

1	149.71	-2.88	3.43	-29.81	-1.51	9.47	-12.88	12.47
2	-2.88	82.93	33.97	2.88	9.83	-12.03	-12.86	4.40
3	3.43	33.97	133.02	-9.87	-22.20	38.47	-40.66	8.42
4	-29.81	2.88	-9.87	54.41	10.43	-12.26	-19.08	-9.00
5	-1.51	9.83	-22.20	10.43	216.49	-0.49	-7.87	20.18
6	9.47	-12.03	38.47	-12.26	-0.49	208.48	41.52	-10.43
7	-12.88	-12.86	-40.66	-19.08	-7.87	41.52	97.17	-22.04
8	12.47	4.40	8.42	-9.00	20.18	-10.43	-22.04	141.60

Signature Name: CLASS 69

Number of points =   9632

Band	1	2	3	4	5	6	7	8
Minimum	5	51	22	198	39	55	1	0
Mean	23.32	87.61	53.90	230.35	76.80	89.92	19.18	9.68
Standard	9.34	11.84	10.42	6.54	12.05	14.20	7.96	9.36
Maximum	54	129	95	254	129	134	73	68

Covariance Matrix

1	87.16	-13.34	-25.24	-18.05	22.10	-20.20	-1.74	24.14
2	-13.34	140.17	40.64	-33.57	11.35	-20.20	-16.16	16.45
3	-25.24	40.64	108.67	-5.51	-19.78	17.49	-20.15	-13.84
4	-18.05	-33.57	-5.51	42.71	-10.22	17.51	-2.88	-19.32
5	22.10	11.35	-19.78	-10.22	145.18	-25.22	-4.12	4.34
6	-20.20	-20.20	17.49	17.51	-25.22	201.62	32.78	-8.18
7	-1.74	-16.16	-20.15	-2.88	-4.12	32.78	63.30	8.20
8	24.14	16.45	-13.84	-19.32	4.34	-8.18	8.20	87.63

Signature Name: CLASS 70

Number of points =   7295

Band	1	2	3	4	5	6	7	8
Minimum	5	22	51	183	10	23	0	0
Mean	21.75	109.36	92.91	227.39	37.84	66.90	6.33	7.99
Standard	12.69	11.66	13.92	7.92	12.36	12.53	6.51	9.83
Maximum	68	149	128	254	82	90	39	60

Covariance Matrix

1	160.98	16.44	-19.80	-53.74	49.40	-3.68	-1.85	44.40
2	16.44	135.96	-18.44	-1.88	-7.44	-16.96	-1.00	1.93
3	-19.80	-18.44	193.85	12.50	10.10	-16.66	-22.96	-14.66
4	-53.74	-1.88	12.50	62.71	-30.19	-0.96	-24.23	-23.18
5	49.40	-7.44	10.10	-30.19	152.82	7.17	25.86	16.57
6	-3.68	-16.96	-16.66	-0.96	7.17	157.12	12.30	-4.94
7	-1.85	-1.00	-22.96	-24.23	25.86	12.30	42.40	6.87
8	44.40	1.93	-14.66	-23.18	16.57	-4.94	6.87	96.54

Signature Name: CLASS 71

Number of points =   8051

Band	1	2	3	4	5	6	7	8
Minimum	5	67	36	179	10	76	1	0
Mean	18.89	112.08	85.21	226.71	36.29	101.83	9.70	5.77
Standard	10.36	10.72	13.18	5.43	11.44	11.42	6.50	7.97
Maximum	62	148	114	247	72	143	46	58

Covariance Matrix

1	107.35	-1.96	-0.33	-27.88	4.31	2.99	-9.58	23.36
2	-1.96	114.98	-10.46	0.08	-14.00	24.85	3.02	11.42
3	-0.33	-10.46	173.80	3.67	-10.36	11.19	-23.00	-12.64
4	-27.88	0.08	3.67	29.48	-8.98	-6.03	-12.55	-6.43
5	4.31	-14.00	-10.36	-8.98	130.96	-9.02	17.97	-3.12
6	2.99	24.85	11.19	-6.03	-9.02	130.41	5.76	3.47
7	-9.58	3.02	-23.00	-12.55	17.97	5.76	42.30	4.54
8	23.36	11.42	-12.64	-6.43	-3.12	3.47	4.54	63.54

A24

Signature Name: CLASS 72

Number of points = 9144

Band	1	2	3	4	5	6	7	8
Minimum	5	60	51	163	44	68	1	0
Mean	35.32	101.30	78.02	221.49	76.37	110.89	13.96	9.90
Standard	11.80	7.42	9.94	7.04	12.34	14.55	7.92	8.54
Maximum	77	133	115	242	133	163	51	67

Covariance Matrix

1	139.16	-9.65	-9.89	-25.14	20.16	-25.49	-28.20	1.40
2	-9.65	54.99	17.60	-5.26	-3.09	-9.44	-5.50	-3.58
3	-9.89	17.60	98.88	-3.86	-14.67	5.92	-25.04	-14.36
4	-25.14	-5.26	-3.86	49.51	4.70	12.07	-8.83	-6.67
5	20.16	-3.09	-14.67	4.70	152.29	35.02	-11.39	7.93
6	-25.49	-9.44	5.92	12.07	35.02	211.67	10.51	3.45
7	-28.20	-5.50	-25.04	-8.83	-11.39	10.51	62.75	8.29
8	1.40	-3.58	-14.36	-6.67	7.93	3.45	8.29	72.99

Signature Name: CLASS 73

Number of points = 2744

Band	1	2	3	4	5	6	7	8
Minimum	62	34	0	96	6	0	0	0
Mean	112.03	87.17	42.94	187.81	45.85	62.76	23.67	53.01
Standard	20.56	15.01	15.42	18.49	15.92	17.83	16.84	22.94
Maximum	195	132	151	245	108	110	84	112

Covariance Matrix

1	422.54	-65.22	-5.09	-70.77	-41.30	-23.17	-14.30	48.51
2	-65.22	225.31	32.82	10.05	84.03	14.35	-35.61	-2.39
3	-5.09	32.82	237.75	43.71	1.44	103.48	-83.99	28.32
4	-70.77	10.05	43.71	341.89	-5.61	53.86	-97.52	38.86
5	-41.30	84.03	1.44	-5.61	253.60	4.96	-26.99	-8.62
6	-23.17	14.35	103.48	53.86	4.96	317.80	-12.86	-11.01
7	-14.30	-35.61	-83.99	-97.52	-26.99	-12.86	283.56	-54.28
8	48.51	-2.39	28.32	38.86	-8.62	-11.01	-54.28	526.44

Signature Name: CLASS 74

Number of points = 4842

Band	1	2	3	4	5	6	7	8
Minimum	0	26	35	132	11	45	21	0
Mean	27.63	82.79	81.59	186.06	72.11	94.91	68.35	32.08
Standard	16.28	13.73	17.67	16.37	17.09	17.59	15.82	18.90
Maximum	92	132	145	222	131	162	113	97

Covariance Matrix

1	264.99	0.08	-86.01	-18.63	19.22	-5.48	50.37	92.31
2	0.08	188.44	-27.63	-22.33	88.03	-14.80	-71.89	55.85
3	-86.01	-27.63	312.21	-88.03	-2.93	116.74	-12.97	-52.57
4	-18.63	-22.33	-88.03	268.10	-51.61	-0.74	25.59	-18.95
5	19.22	88.03	-2.93	-51.61	292.20	24.95	-39.34	5.45
6	-5.48	-14.80	116.74	-0.74	24.95	309.38	21.58	-24.77
7	50.37	-71.89	-12.97	25.59	-39.34	21.58	250.32	-8.65
8	92.31	55.85	-52.57	-18.95	5.45	-24.77	-8.65	357.10

Appendix A   Listing of Class Statistics

Signature Name: CLASS 75

Number of points =   4658

Band	1	2	3	4	5	6	7	8
Minimum	5	20	112	187	8	36	0	0
Mean	10.82	107.11	149.96	230.76	28.82	75.08	3.93	5.70
Standard	5.69	15.32	16.00	4.92	9.65	18.19	2.11	9.12
Maximum	81	139	193	249	72	129	27	48

Covariance Matrix

1	32.35	19.32	6.50	-13.88	3.62	-10.98	0.86	22.44
2	19.32	234.58	37.79	2.76	-3.58	-3.22	0.55	6.97
3	6.50	37.79	256.11	-3.23	-8.98	55.87	3.16	7.00
4	-13.88	2.76	-3.23	24.17	0.90	0.29	-1.46	-10.54
5	3.62	-3.58	-8.98	0.90	93.06	0.52	-0.50	19.31
6	-10.98	-3.22	55.87	0.29	0.52	330.71	3.70	-25.36
7	0.86	0.55	3.16	-1.46	-0.50	3.70	4.45	-1.99
8	22.44	6.97	7.00	-10.54	19.31	-25.36	-1.99	83.14

Signature Name: CLASS 76

Number of points =   3315

Band	1	2	3	4	5	6	7	8
Minimum	5	18	0	157	10	0	0	36
Mean	52.97	95.78	58.99	212.51	51.01	75.15	17.65	75.13
Standard	19.61	16.65	17.74	14.05	17.41	18.72	13.64	22.78
Maximum	112	145	114	252	116	122	80	176

Covariance Matrix

1	384.45	-21.27	-1.07	-42.88	-0.56	15.80	-46.02	93.58
2	-21.27	277.16	19.14	-13.98	67.62	21.79	26.91	-71.18
3	-1.07	19.14	314.69	-6.83	-67.94	57.00	-55.24	-6.95
4	-42.88	-13.98	-6.83	197.47	-13.17	14.51	-58.57	-11.69
5	-0.56	67.62	-67.94	-13.17	303.23	49.06	56.69	-59.63
6	15.80	21.79	57.00	14.51	49.06	350.43	32.63	-42.72
7	-46.02	26.91	-55.24	-58.57	56.69	32.63	186.10	-33.73
8	93.58	-71.18	-6.95	-11.69	-59.63	-42.72	-33.73	518.87

Signature Name: CLASS 77

Number of points =   5746

Band	1	2	3	4	5	6	7	8
Minimum	5	26	36	173	11	86	1	0
Mean	16.35	88.66	77.71	228.91	46.73	124.89	16.60	7.40
Standard	9.43	13.06	12.67	7.25	13.53	14.25	8.52	8.84
Maximum	49	134	115	249	88	162	51	68

Covariance Matrix

1	88.93	12.66	-10.97	-32.74	2.60	-13.08	-2.81	20.45
2	12.66	170.51	-0.88	-7.95	46.63	35.95	-4.02	3.48
3	-10.97	-0.88	160.65	-10.93	13.16	20.64	-28.04	-7.48
4	-32.74	-7.95	-10.93	52.60	14.61	13.57	-4.97	-10.51
5	2.60	46.63	13.16	14.61	182.96	5.61	-13.09	-3.91
6	-13.08	35.95	20.64	13.57	5.61	203.14	17.49	1.82
7	-2.81	-4.02	-28.04	-4.97	-13.09	17.49	72.67	3.17
8	20.45	3.48	-7.48	-10.51	-3.91	1.82	3.17	78.23

Signature Name: CLASS 78

Number of points =   6448

Band	1	2	3	4	5	6	7	8
Minimum	5	55	88	165	11	91	0	0
Mean	14.63	111.14	118.07	226.76	38.32	121.54	7.00	5.71
Standard	7.95	10.53	14.48	4.97	11.02	11.89	5.84	8.27
Maximum	63	145	177	247	87	150	43	54

Covariance Matrix

1	63.22	19.61	-15.37	-20.42	11.29	12.77	4.00	30.72
2	19.61	110.80	-36.31	-7.07	-18.86	18.44	15.64	8.04
3	-15.37	-36.31	209.76	4.31	8.62	3.62	-26.28	-0.28
4	-20.42	-7.07	4.31	24.65	-6.75	-4.05	-7.28	-11.02
5	11.29	-18.86	8.62	-6.75	121.54	30.87	-5.72	11.02
6	12.77	18.44	3.62	-4.05	30.87	141.34	13.05	6.19
7	4.00	15.64	-26.28	-7.28	-5.72	13.05	34.16	6.24
8	30.72	8.04	-0.28	-11.02	11.02	6.19	6.24	68.40

Signature Name: CLASS 79

Number of points =   2004

Band	1	2	3	4	5	6	7	8
Minimum	0	31	26	79	5	0	3	-29
Mean	46.32	66.30	79.02	141.73	60.58	55.85	54.87	89.13
Standard	22.07	14.58	26.65	15.71	21.75	23.46	18.17	26.37
Maximum	123	123	187	200	121	136	117	253

Covariance Matrix

1	486.89	30.09	-113.98	4.06	35.84	-20.64	49.91	135.22
2	30.09	212.69	-60.83	112.29	220.91	77.55	14.41	73.60
3	-113.98	-60.83	709.98	-74.29	-41.94	129.03	-151.68	-194.16
4	4.06	112.29	-74.29	246.87	47.57	50.29	-0.62	-1.14
5	35.84	220.91	-41.94	47.57	473.06	180.53	95.41	55.84
6	-20.64	77.55	129.03	50.29	180.53	550.26	174.16	40.58
7	49.91	14.41	-151.68	-0.62	95.41	174.16	330.13	52.53
8	135.22	73.60	-194.16	-1.14	55.84	40.58	52.53	695.37

Signature Name: CLASS 80

Number of points =   5090

Band	1	2	3	4	5	6	7	8
Minimum	11	48	0	145	11	85	1	0
Mean	53.45	99.01	75.65	211.01	57.20	125.22	21.64	27.12
Standard	15.12	11.56	13.33	9.56	13.39	13.28	9.17	16.83
Maximum	109	140	130	242	108	190	75	66

Covariance Matrix

1	228.53	-27.25	-10.24	-50.88	18.97	-3.37	-9.39	-70.13
2	-27.25	133.60	19.58	-4.43	-6.15	-9.92	22.96	34.11
3	-10.24	19.58	177.57	-7.76	-23.05	24.18	-29.91	-10.26
4	-50.88	-4.43	-7.76	91.39	7.81	14.50	-16.48	23.57
5	18.97	-6.15	-23.05	7.81	179.31	25.20	-4.20	0.88
6	-3.37	-9.92	24.18	14.50	25.20	176.28	-0.81	-35.72
7	-9.39	22.96	-29.91	-16.48	-4.20	-0.81	84.03	8.48
8	-70.13	34.11	-10.26	23.57	0.88	-35.72	8.48	283.34

Signature Name: CLASS 81

Number of points = 5110

Band	1	2	3	4	5	6	7	8
Minimum	0	8	0	166	9	90	10	0
Mean	18.60	74.41	55.27	230.72	56.60	128.53	45.59	6.14
Standard	8.72	11.43	12.00	7.30	14.65	13.90	17.61	7.92
Maximum	51	121	107	251	101	176	106	60

Covariance Matrix

1	76.09	9.48	-28.23	-1.54	15.28	-5.14	-21.83	25.08
2	9.48	130.68	11.90	-6.24	47.51	7.34	39.00	11.43
3	-28.23	11.90	143.98	-28.62	-7.62	75.42	40.89	5.38
4	-1.54	-6.24	-28.62	53.22	17.48	-8.95	-72.76	-4.47
5	15.28	47.51	-7.62	17.48	214.59	-10.38	-1.65	-9.76
6	-5.14	7.34	75.42	-8.95	-10.38	193.20	9.56	0.92
7	-21.83	39.00	40.89	-72.76	-1.65	9.56	310.17	-10.89
8	25.08	11.43	5.38	-4.47	-9.76	0.92	-10.89	62.76

Signature Name: CLASS 82

Number of points = 3509

Band	1	2	3	4	5	6	7	8
Minimum	5	15	0	160	13	136	0	0
Mean	22.56	86.82	78.40	225.48	60.66	171.71	33.41	11.96
Standard	11.69	13.96	17.53	10.30	15.65	16.86	18.99	11.98
Maximum	94	133	118	242	123	251	99	77

Covariance Matrix

1	136.77	16.27	-10.10	-29.76	0.20	9.52	29.33	31.71
2	16.27	194.86	-14.06	-4.71	23.76	-21.28	-94.40	39.83
3	-10.10	-14.06	307.31	-11.36	45.13	-67.14	-9.35	-3.98
4	-29.76	-4.71	-11.36	106.10	-27.73	-28.46	-75.63	-12.82
5	0.20	23.76	45.13	-27.73	244.82	-21.49	-15.05	1.31
6	9.52	-21.28	-67.14	-28.46	-21.49	284.25	48.40	8.93
7	29.33	-94.40	-9.35	-75.63	-15.05	48.40	360.44	5.96
8	31.71	39.83	-3.98	-12.82	1.31	8.93	5.96	143.64

Signature Name: CLASS 83

Number of points = 3878

Band	1	2	3	4	5	6	7	8
Minimum	5	63	79	163	11	132	0	0
Mean	18.28	104.83	120.86	226.42	49.06	160.63	9.50	9.97
Standard	9.47	14.09	17.83	6.73	13.56	13.39	7.32	11.92
Maximum	66	142	174	249	96	197	80	64

Covariance Matrix

1	89.59	22.97	8.97	-28.75	2.84	-9.47	-2.08	31.48
2	22.97	198.63	1.79	-9.53	-13.41	-5.00	-11.96	-11.30
3	8.97	1.79	317.83	-18.03	-49.67	-30.77	-22.51	15.17
4	-28.75	-9.53	-18.03	45.23	2.23	4.13	-16.00	-13.50
5	2.84	-13.41	-49.67	2.23	183.75	-10.91	-6.17	-0.34
6	-9.47	-5.00	-30.77	4.13	-10.91	179.32	5.02	-17.83
7	-2.08	-11.96	-22.51	-16.00	-6.17	5.02	53.60	14.10
8	31.48	-11.30	15.17	-13.50	-0.34	-17.83	14.10	142.02

Signature Name: CLASS 84

Number of points =   1576

Band	1	2	3	4	5	6	7	8
Minimum	5	27	84	156	10	30	0	19
Mean	31.79	93.69	129.84	220.43	40.33	88.61	6.05	63.36
Standard	15.73	18.81	20.49	11.93	12.18	23.26	5.66	20.43
Maximum	97	138	184	248	83	144	33	147

Covariance Matrix

1	247.30	20.44	21.22	-52.80	-12.19	-22.86	-3.86	36.11
2	20.44	353.65	33.00	6.28	15.02	-13.69	17.13	-9.65
3	21.22	33.00	419.84	3.16	-10.35	-37.61	-34.21	-1.23
4	-52.80	6.28	3.16	142.39	1.56	18.64	-21.52	8.08
5	-12.19	15.02	-10.35	1.56	148.47	71.26	11.98	6.28
6	-22.86	-13.69	-37.61	18.64	71.26	540.92	27.00	-46.60
7	-3.86	17.13	-34.21	-21.52	11.98	27.00	32.08	-10.44
8	36.11	-9.65	-1.23	8.08	6.28	-46.60	-10.44	417.49

Signature Name: CLASS 85

Number of points =   1276

Band	1	2	3	4	5	6	7	8
Minimum	8	54	42	131	16	125	0	0
Mean	54.84	109.52	99.10	202.03	59.79	162.90	32.33	49.05
Standard	21.88	15.53	19.78	18.14	19.21	19.39	16.37	17.86
Maximum	112	142	158	235	131	221	84	107

Covariance Matrix

1	478.66	-63.97	-13.30	-47.30	10.16	84.03	-56.89	-40.25
2	-63.97	241.14	-41.21	32.18	-58.91	-30.23	-20.81	-1.16
3	-13.30	-41.21	391.28	-54.40	17.32	-46.32	-35.90	-48.56
4	-47.30	32.18	-54.40	328.93	-110.23	-22.16	-160.98	11.05
5	10.16	-58.91	17.32	-110.23	368.92	44.81	14.91	29.01
6	84.03	-30.23	-46.32	-22.16	44.81	375.95	29.13	13.13
7	-56.89	-20.81	-35.90	-160.98	14.91	29.13	267.85	-7.95
8	-40.25	-1.16	-48.56	11.05	29.01	13.13	-7.95	318.95

Signature Name: CLASS 86

Number of points =   1572

Band	1	2	3	4	5	6	7	8
Minimum	0	24	0	137	11	85	0	58
Mean	61.58	98.48	74.66	208.38	53.78	132.29	25.03	95.74
Standard	22.09	13.81	20.53	14.63	17.21	20.38	17.44	23.49
Maximum	127	136	131	243	115	251	81	231

Covariance Matrix

1	487.93	-31.35	-51.69	-92.63	-58.39	-43.57	-26.39	120.30
2	-31.35	190.64	34.29	18.99	-3.13	-8.47	-3.34	-61.97
3	-51.69	34.29	421.47	5.48	13.29	-72.11	28.52	-9.14
4	-92.63	18.99	5.48	213.99	10.73	26.35	-76.78	-56.18
5	-58.39	-3.13	13.29	10.73	296.12	-5.98	-50.97	-24.94
6	-43.57	-8.47	-72.11	26.35	-5.98	415.35	13.27	-62.66
7	-26.39	-3.34	28.52	-76.78	-50.97	13.27	304.29	-11.23
8	120.30	-61.97	-9.14	-56.18	-24.94	-62.66	-11.23	551.89

Signature Name: CLASS 87

Number of points = 2593

Band	1	2	3	4	5	6	7	8
Minimum	5	15	0	178	11	178	1	0
Mean	14.03	95.03	106.79	227.34	48.54	212.60	18.07	7.56
Standard	8.26	19.49	23.12	7.43	14.06	18.14	13.98	9.84
Maximum	59	140	148	251	94	254	56	56

Covariance Matrix

1	68.16	53.11	-46.72	-23.88	13.19	-7.28	11.29	36.73
2	53.11	379.78	-0.13	-11.49	17.89	-60.97	-58.51	16.96
3	-46.72	-0.13	534.45	3.49	27.54	-30.12	21.24	-19.67
4	-23.88	-11.49	3.49	55.13	-16.98	1.37	-30.33	-8.94
5	13.19	17.89	27.54	-16.98	197.67	-7.20	26.39	16.70
6	-7.28	-60.97	-30.12	1.37	-7.20	328.91	50.68	17.58
7	11.29	-58.51	21.24	-30.33	26.39	50.68	195.34	18.31
8	36.73	16.96	-19.67	-8.94	16.70	17.58	18.31	96.79

Signature Name: CLASS 88

Number of points = 1591

Band	1	2	3	4	5	6	7	8
Minimum	5	7	56	156	5	67	0	0
Mean	6.14	30.52	128.63	225.78	22.15	150.49	10.34	3.26
Standard	3.08	13.96	32.79	15.30	8.79	36.82	12.23	8.17
Maximum	30	76	219	251	74	243	97	58

Covariance Matrix

1	9.48	13.96	5.54	-2.90	4.87	2.54	-1.22	19.50
2	13.96	194.96	105.64	-15.33	53.25	-14.88	-11.21	42.65
3	5.54	105.64	1075.05	-34.28	-27.40	13.07	-98.46	24.43
4	-2.90	-15.33	-34.28	234.05	-5.65	16.32	-96.38	-7.09
5	4.87	53.25	-27.40	-5.65	77.32	30.23	5.45	13.91
6	2.54	-14.88	13.07	16.32	30.23	1355.97	57.16	0.15
7	-1.22	-11.21	-98.46	-96.38	5.45	57.16	149.52	-7.58
8	19.50	42.65	24.43	-7.09	13.91	0.15	-7.58	66.76

Signature Name: CLASS 89

Number of points = 1661

Band	1	2	3	4	5	6	7	8
Minimum	5	19	147	127	9	31	0	0
Mean	22.43	97.70	192.47	212.50	36.44	83.43	6.54	29.56
Standard	15.26	24.58	19.60	26.21	11.67	27.20	7.47	22.54
Maximum	118	137	253	241	80	142	30	114

Covariance Matrix

1	232.73	53.60	7.72	-40.43	20.90	-78.46	-23.07	178.80
2	53.60	604.38	48.54	423.26	28.50	50.48	-114.90	-53.30
3	7.72	48.54	384.23	69.12	-35.18	-12.65	-13.65	-53.85
4	-40.43	423.26	69.12	686.77	16.34	243.22	-158.82	-159.59
5	20.90	28.50	-35.18	16.34	136.21	81.67	5.36	38.89
6	-78.46	50.48	-12.65	243.22	81.67	739.63	-26.06	-54.92
7	-23.07	-114.90	-13.65	-158.82	5.36	-26.06	55.86	1.06
8	178.80	-53.30	-53.85	-159.59	38.89	-54.92	1.06	507.93

Signature Name: CLASS 90

Number of points =   637

Band	1	2	3	4	5	6	7	8
Minimum	7	35	102	167	7	105	0	48
Mean	44.08	82.98	158.36	216.08	43.83	157.74	5.33	98.02
Standard	20.16	16.83	27.30	13.43	13.67	27.15	4.42	27.17
Maximum	112	129	242	251	93	230	22	204

Covariance Matrix

1	406.31	-85.10	9.56	-128.06	-22.23	61.88	-0.74	167.56
2	-85.10	283.19	-53.92	46.76	43.03	-60.62	13.09	-73.25
3	9.56	-53.92	745.55	3.29	-51.00	46.00	-12.49	-53.97
4	-128.06	46.76	3.29	180.44	18.67	-31.16	5.67	-29.98
5	-22.23	43.03	-51.00	18.67	186.83	-41.08	14.18	-10.84
6	61.88	-60.62	46.00	-31.16	-41.08	736.92	3.46	49.86
7	-0.74	13.09	-12.49	5.67	14.18	3.46	19.56	-10.08
8	167.56	-73.25	-53.97	-29.98	-10.84	49.86	-10.08	738.35

Signature Name: CLASS 91

Number of points =   733

Band	1	2	3	4	5	6	7	8
Minimum	0	29	54	76	5	72	11	0
Mean	17.14	54.83	126.94	125.81	42.13	146.67	54.23	70.72
Standard	20.06	14.80	26.69	21.11	21.67	31.80	12.65	39.87
Maximum	100	109	225	188	111	251	92	233

Covariance Matrix

1	402.21	-28.65	272.38	113.10	44.16	-235.89	-72.02	-61.58
2	-28.65	219.09	-104.92	83.65	244.65	-72.61	-5.87	-23.61
3	272.38	-104.92	712.36	125.00	-107.93	-35.19	-152.66	-375.49
4	113.10	83.65	125.00	445.64	52.12	-356.53	-103.72	-287.93
5	44.16	244.65	-107.93	52.12	469.60	-145.08	56.68	25.51
6	-235.89	-72.61	-35.19	-356.53	-145.08	1011.07	58.21	425.93
7	-72.02	-5.87	-152.66	-103.72	56.68	58.21	159.96	101.69
8	-61.58	-23.61	-375.49	-287.93	25.51	425.93	101.69	1589.67

Signature Name: CLASS 92

Number of points =   1887

Band	1	2	3	4	5	6	7	8
Minimum	5	13	137	172	9	141	0	0
Mean	14.74	98.25	173.56	226.00	39.17	197.27	7.45	12.37
Standard	7.91	20.26	22.39	7.13	12.31	26.21	5.70	14.15
Maximum	89	138	245	251	80	254	97	77

Covariance Matrix

1	62.49	33.16	1.04	-27.94	-2.94	-22.80	14.63	40.54
2	33.16	410.52	-14.61	9.07	34.54	-197.84	-1.63	-26.37
3	1.04	-14.61	501.47	-18.70	35.60	8.72	-14.06	-14.56
4	-27.94	9.07	-18.70	50.80	-3.99	-9.79	-17.16	-9.51
5	-2.94	34.54	35.60	-3.99	151.45	-1.84	-2.95	14.68
6	-22.80	-197.84	8.72	-9.79	-1.84	687.19	13.17	-27.86
7	14.63	-1.63	-14.06	-17.16	-2.95	13.17	32.51	-0.50
8	40.54	-26.37	-14.56	-9.51	14.68	-27.86	-0.50	200.08

Appendix A   Listing of Class Statistics

Signature Name: CLASS 93

Number of points =   816

Band	1	2	3	4	5	6	7	8
Minimum	0	37	91	83	8	0	0	42
Mean	82.49	75.05	167.18	197.68	36.79	71.20	7.07	121.71
Standard	34.78	19.33	38.31	22.80	13.21	31.66	9.93	35.27
Maximum	224	128	253	247	94	141	48	242

Covariance Matrix

1	1209.81	-119.74	122.89	-177.57	-60.26	40.05	-2.88	70.07
2	-119.74	373.58	130.65	78.59	70.98	13.27	-13.83	-139.60
3	122.89	130.65	1467.61	-131.35	35.19	227.38	-45.58	-331.18
4	-177.57	78.59	-131.35	520.05	29.00	-0.53	-66.55	105.32
5	-60.26	70.98	35.19	29.00	174.61	-61.51	36.87	8.80
6	40.05	13.27	227.38	-0.53	-61.51	1002.59	-162.34	-25.67
7	-2.88	-13.83	-45.58	-66.55	36.87	-162.34	98.63	7.77
8	70.07	-139.60	-331.18	105.32	8.80	-25.67	7.77	1243.88

Signature Name: CLASS 94

Number of points =   1900

Band	1	2	3	4	5	6	7	8
Minimum	59	37	0	126	14	76	0	. 0
Mean	110.95	86.25	68.78	179.56	49.08	124.63	35.76	58.73
Standard	21.49	14.44	16.35	18.61	17.10	21.82	20.49	24.63
Maximum	194	130	145	230	108	193	88	136

Covariance Matrix

1	461.87	-31.44	13.71	-59.40	35.88	70.81	-67.04	92.85
2	-31.44	208.38	59.23	23.78	-23.65	-41.03	-53.63	-3.00
3	13.71	59.23	267.26	-36.96	3.81	10.41	40.21	-56.81
4	-59.40	23.78	-36.96	346.27	11.83	11.43	-208.40	20.85
5	35.88	-23.65	3.81	11.83	292.27	77.63	-33.06	-42.32
6	70.81	-41.03	10.41	11.43	77.63	476.20	-64.80	30.40
7	-67.04	-53.63	40.21	-208.40	-33.06	-64.80	419.69	-27.68
8	92.85	-3.00	-56.81	20.85	-42.32	30.40	-27.68	606.40

Signature Name: CLASS 95

Number of points =   787

Band	1	2	3	4	5	6	7	8
Minimum	5	36	84	147	13	172	0	0
Mean	41.73	98.68	137.35	215.65	54.23	216.14	19.87	65.44
Standard	21.56	17.27	19.12	13.86	20.02	17.56	16.39	23.38
Maximum	112	140	189	251	118	253	52	145

Covariance Matrix

1	464.94	-0.42	2.32	-153.95	133.65	25.98	116.28	58.09
2	-0.42	298.27	-78.69	-11.07	48.68	6.04	94.23	-92.54
3	2.32	-78.69	365.68	-30.58	-69.91	8.18	-108.55	7.71
4	-153.95	-11.07	-30.58	191.97	-83.98	14.38	-101.91	6.50
5	133.65	48.68	-69.91	-83.98	400.83	37.12	152.51	-8.54
6	25.98	6.04	8.18	14.38	37.12	308.31	43.74	6.56
7	116.28	94.23	-108.55	-101.91	152.51	43.74	268.58	-51.28
8	58.09	-92.54	7.71	6.50	-8.54	6.56	-51.28	546.57

Signature Name: CLASS 96

Number of points =   484

Band	1	2	3	4	5	6	7	8
Minimum	0	21	0	105	8	122	0	38
Mean	119.41	76.03	110.72	170.58	57.18	196.56	43.41	132.46
Standard	32.01	18.49	31.12	25.16	21.79	26.00	19.78	40.54
Maximum	188	129	242	230	124	251	80	254

Covariance Matrix

1	1024.60	-29.10	32.02	-143.82	-64.11	-65.96	108.78	-300.41
2	-29.10	342.04	27.20	55.35	196.56	-11.35	24.06	-114.00
3	32.02	27.20	968.25	115.09	117.08	267.24	-145.70	22.65
4	-143.82	55.35	115.09	633.18	32.92	0.57	-239.22	-40.57
5	-64.11	196.56	117.08	32.92	474.64	13.35	81.26	-46.50
6	-65.96	-11.35	267.24	0.57	13.35	675.90	22.68	13.42
7	108.78	24.06	-145.70	-239.22	81.26	22.68	391.19	-145.83
8	-300.41	-114.00	22.65	-40.57	-46.50	13.42	-145.83	1643.53

Signature Name: CLASS 97

Number of points =   1081

Band	1	2	3	4	5	6	7	8
Minimum	134	33	49	61	8	104	1	.0
Mean	216.80	68.52	102.25	123.65	54.83	164.70	61.16	65.12
Standard	24.68	13.73	28.04	17.87	27.14	35.81	15.78	25.42
Maximum	254	96	233	193	125	251	94	118

Covariance Matrix

1	609.01	-98.89	-11.78	-220.62	107.95	-231.50	69.45	46.51
2	-98.89	188.65	-113.33	18.38	191.76	-122.29	20.52	10.80
3	-11.78	-113.33	786.40	4.89	-395.64	633.83	-284.61	-24.95
4	-220.62	18.38	4.89	319.44	-130.55	130.06	-95.83	-46.87
5	107.95	191.76	-395.64	-130.55	736.49	-594.51	256.74	38.78
6	-231.50	-122.29	633.83	130.06	-594.51	1282.33	-211.27	-1.57
7	69.45	20.52	-284.61	-95.83	256.74	-211.27	248.90	47.60
8	46.51	10.80	-24.95	-46.87	38.78	-1.57	47.60	646.04

Signature Name: CLASS 98

Number of points =   1868

Band	1	2	3	4	5	6	7	8
Minimum	0	30	0	81	4	0	0	83
Mean	139.19	67.26	47.43	173.50	38.01	59.11	27.66	149.57
Standard	35.83	17.38	29.16	27.62	18.06	29.00	26.32	34.26
Maximum	249	124	164	251	125	157	108	253

Covariance Matrix

1	1283.55	-162.34	-137.05	-362.00	-135.05	-83.15	76.81	-0.03
2	-162.34	302.23	42.98	156.54	147.56	122.67	-68.55	-142.13
3	-137.05	42.98	850.36	230.31	10.08	369.70	-232.91	-17.65
4	-362.00	156.54	230.31	762.90	13.20	219.88	-328.33	-145.61
5	-135.05	147.56	10.08	13.20	326.04	27.33	66.77	2.31
6	-83.15	122.67	369.70	219.88	27.33	841.09	-129.61	-49.04
7	76.81	-68.55	-232.91	-328.33	66.77	-129.61	692.89	155.93
8	-0.03	-142.13	-17.65	-145.61	2.31	-49.04	155.93	1173.44

Appendix A   Listing of Class Statistics

Signature Name: CLASS 99

Number of points = 2728

Band	1	2	3	4	5	6	7	8
Minimum	145	21	0	76	4	0	0	0
Mean	217.08	63.18	33.94	125.31	40.89	56.66	51.63	45.35
Standard	22.90	13.06	19.45	24.35	30.16	23.44	29.79	26.45
Maximum	254	104	187	216	132	134	107	145

Covariance Matrix

1	524.29	-73.15	-26.56	-227.44	-55.74	32.57	213.17	25.22
2	-73.15	170.58	65.66	79.07	295.99	75.93	43.21	60.45
3	-26.56	65.66	378.30	-75.50	229.65	331.03	99.89	72.32
4	-227.44	79.07	-75.50	593.11	-79.38	-109.13	-339.48	72.72
5	-55.74	295.99	229.65	-79.38	909.43	318.78	480.55	82.91
6	32.57	75.93	331.03	-109.13	318.78	549.26	221.14	112.36
7	213.17	43.21	99.89	-339.48	480.55	221.14	887.53	-130.51
8	25.22	60.45	72.32	72.72	82.91	112.36	-130.51	699.84

Signature Name: CLASS 100

Number of points = 616

Band	1	2	3	4	5	6	7	8
Minimum	131	31	0	53	6	78	1	87
Mean	205.07	63.93	91.70	138.38	40.08	170.36	51.41	147.47
Standard	28.74	15.73	30.53	23.64	16.98	37.88	18.32	33.97
Maximum	254	103	233	204	116	251	91	253

Covariance Matrix

1	826.22	-175.00	24.93	-184.62	-38.71	-23.57	69.84	11.21
2	-175.00	247.54	-73.49	61.46	101.83	20.08	-15.24	-121.27
3	24.93	-73.49	931.84	-200.89	-59.81	551.80	115.06	23.72
4	-184.62	61.46	-200.89	558.93	-51.31	103.05	-219.21	-49.92
5	-38.71	101.83	-59.81	-51.31	288.31	-61.70	62.75	-31.96
6	-23.57	20.08	551.80	103.05	-61.70	1434.62	-94.61	-103.76
7	69.84	-15.24	115.06	-219.21	62.75	-94.61	335.70	-5.86
8	11.21	-121.27	23.72	-49.92	-31.96	-103.76	-5.86	1153.74

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13. ABSTRACT (Maximum 200 words)

Testing and evaluation of smart munitions have demonstrated that they are highly sensitive to variations in background conditions. Terrain and weather variables comprising background conditions must therefore be included as factors in the generation of Joint Munitions Effectiveness Manuals (JMEM). The goal of this study, sponsored by the Joint Technical Coordinating Group/Munitions Effectiveness (JCTG/ME) Smart Munitions Working Group, was to develop a procedure for characterizing the set of worldwide background conditions which must be represented in the development of JMEM lookup tables. This report documents the test of a multivariate analysis of a global ecosystems database as a candidate environmental classification technique. Preliminary results are promising, although questions related to resolution, suitability of chosen parameters, and number of required classes need to be addressed in further work.

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