

AES 670 Final Project

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1 Abstract

2 Data and Domain of Analysis

3 Tables

| | ice cloud | water cloud | vegetation | water | arid | uncertain |
|-----------------------|-----------|-------------|------------|--------|-------|-----------|
| thresh Pixels | 10094 | 2227 | 36614 | 96730 | 68922 | |
| thresh Areas | 14426 | 3221 | 48431 | 181319 | 85435 | |
| samples thresh Pixels | 393 | 369 | 397 | 399 | 399 | |
| samples thresh Areas | 560 | 519 | 532 | 742 | 518 | |
| mlc thresh Pixels | 69620 | 5799 | 43344 | 125432 | 68670 | 14815 |
| mlc thresh Areas | 124604 | 8654 | 55828 | 226847 | 85326 | 27429 |
| | KM1 | KM2 | KM3 | KM4 | KM5 | uncertain |
| km Pixels | 57991 | 149596 | 20064 | 37428 | 62601 | |
| km Areas | 71817 | 277355 | 42338 | 58480 | 78696 | |
| samples km Pixels | 398 | 400 | 396 | 397 | 397 | |
| samples km Areas | 485 | 747 | 846 | 609 | 497 | |
| mlc km Pixels | 58435 | 155717 | 24430 | 22898 | 61084 | 5116 |
| mlc km Areas | 71943 | 287288 | 49023 | 35537 | 77089 | 7806 |

Figure 1: Pixel class areas and counts

| λ | μ | σ | Reflectance Covariance ($\times 10^4$) | | | | | | |
|-------------|-------|----------|--|-------|-------|-------|-------|-------|------|
| Ice Cloud | | | | | | | | | |
| 0.466 | 0.216 | 0.105 | 111.3 | 118.5 | 125.2 | 138.0 | 88.5 | 135.7 | 0.5 |
| 0.554 | 0.180 | 0.117 | 118.5 | 136.2 | 150.1 | 180.7 | 112.2 | 181.6 | 0.6 |
| 0.646 | 0.173 | 0.130 | 125.2 | 150.1 | 169.8 | 211.0 | 129.4 | 215.2 | 0.6 |
| 0.856 | 0.214 | 0.172 | 138.0 | 180.7 | 211.0 | 295.0 | 176.3 | 309.1 | 1.1 |
| 0.936 | 0.138 | 0.104 | 88.5 | 112.2 | 129.4 | 176.3 | 107.7 | 184.0 | 0.9 |
| 1.242 | 0.216 | 0.183 | 135.7 | 181.6 | 215.2 | 309.1 | 184.0 | 335.2 | 1.2 |
| 1.382 | 0.029 | 0.008 | 0.5 | 0.6 | 0.6 | 1.1 | 0.9 | 1.2 | 0.6 |
| Water Cloud | | | | | | | | | |
| 0.466 | 0.560 | 0.092 | 84.9 | 81.5 | 81.2 | 82.5 | 68.0 | 47.9 | 0.0 |
| 0.554 | 0.640 | 0.093 | 81.5 | 86.7 | 75.1 | 78.8 | 76.1 | 54.3 | 0.9 |
| 0.646 | 0.568 | 0.090 | 81.2 | 75.1 | 81.3 | 80.1 | 61.9 | 41.8 | −0.6 |
| 0.856 | 0.550 | 0.090 | 82.5 | 78.8 | 80.1 | 80.7 | 65.4 | 45.8 | −0.1 |
| 0.936 | 0.629 | 0.090 | 68.0 | 76.1 | 61.9 | 65.4 | 81.0 | 49.5 | 1.1 |
| 1.242 | 0.367 | 0.063 | 47.9 | 54.3 | 41.8 | 45.8 | 49.5 | 40.2 | 1.7 |
| 1.382 | 0.009 | 0.006 | 0.0 | 0.9 | −0.6 | −0.1 | 1.1 | 1.7 | 0.3 |
| Vegetation | | | | | | | | | |
| 0.466 | 0.154 | 0.033 | 10.9 | 8.4 | 4.6 | 7.0 | 14.3 | 5.3 | 0.4 |
| 0.554 | 0.312 | 0.058 | 8.4 | 33.5 | 4.4 | 7.2 | 36.5 | 15.0 | 0.1 |
| 0.646 | 0.153 | 0.021 | 4.6 | 4.4 | 4.4 | 4.5 | 6.3 | 0.7 | 0.0 |
| 0.856 | 0.149 | 0.024 | 7.0 | 7.2 | 4.5 | 5.6 | 10.5 | 3.1 | 0.1 |
| 0.936 | 0.329 | 0.068 | 14.3 | 36.5 | 6.3 | 10.5 | 46.8 | 18.0 | 0.4 |
| 1.242 | 0.152 | 0.031 | 5.3 | 15.0 | 0.7 | 3.1 | 18.0 | 9.6 | 0.4 |
| 1.382 | 0.003 | 0.003 | 0.4 | 0.1 | 0.0 | 0.1 | 0.4 | 0.4 | 0.1 |
| Water | | | | | | | | | |
| 0.466 | 0.036 | 0.005 | 0.2 | 0.1 | 0.3 | 0.3 | 0.1 | 0.1 | 0.0 |
| 0.554 | 0.018 | 0.004 | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 | 0.1 | 0.0 |
| 0.646 | 0.131 | 0.010 | 0.3 | 0.2 | 1.1 | 0.5 | 0.1 | 0.0 | −0.0 |
| 0.856 | 0.062 | 0.007 | 0.3 | 0.2 | 0.5 | 0.5 | 0.1 | 0.1 | 0.0 |
| 0.936 | 0.009 | 0.004 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.0 |
| 1.242 | 0.010 | 0.002 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 |
| 1.382 | 0.002 | 0.002 | 0.0 | 0.0 | −0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Arid | | | | | | | | | |
| 0.466 | 0.352 | 0.060 | 35.6 | 39.7 | 15.3 | 25.2 | 44.5 | 14.7 | −0.3 |
| 0.554 | 0.462 | 0.069 | 39.7 | 47.8 | 17.2 | 28.0 | 53.6 | 16.5 | −0.5 |
| 0.646 | 0.223 | 0.030 | 15.3 | 17.2 | 8.8 | 12.4 | 18.9 | 4.7 | −0.3 |
| 0.856 | 0.273 | 0.044 | 25.2 | 28.0 | 12.4 | 19.1 | 31.1 | 9.6 | −0.3 |
| 0.936 | 0.544 | 0.082 | 44.5 | 53.6 | 18.9 | 31.1 | 67.0 | 20.2 | −0.4 |
| 1.242 | 0.243 | 0.037 | 14.7 | 16.5 | 4.7 | 9.6 | 20.2 | 13.5 | 0.4 |
| 1.382 | 0.005 | 0.003 | −0.3 | −0.5 | −0.3 | −0.3 | −0.4 | 0.4 | 0.1 |

Figure 2: thresh reflectance statistics

| λ | μ | σ | Brightness Temp. Covariance ($\times 10^2$) | | | |
|-------------|-------|----------|---|-------|--------|--------|
| Ice Cloud | | | | | | |
| 3.79 | 297.5 | 8.23 | 6771.7 | 808.8 | 332.1 | 711.5 |
| 7.34 | 249.7 | 2.19 | 808.8 | 479.0 | 317.0 | 475.6 |
| 8.53 | 277.4 | 7.32 | 332.1 | 317.0 | 5356.4 | 5191.0 |
| 11.00 | 277.4 | 7.19 | 711.5 | 475.6 | 5191.0 | 5163.8 |
| Water Cloud | | | | | | |
| 3.79 | 313.5 | 2.98 | 888.6 | 176.3 | 244.8 | 270.8 |
| 7.34 | 254.1 | 1.28 | 176.3 | 164.8 | 195.4 | 233.4 |
| 8.53 | 276.8 | 2.47 | 244.8 | 195.4 | 612.1 | 627.3 |
| 11.00 | 278.8 | 2.61 | 270.8 | 233.4 | 627.3 | 683.9 |
| Vegetation | | | | | | |
| 3.79 | 312.6 | 3.47 | 1201.7 | 212.7 | 867.3 | 1000.8 |
| 7.34 | 256.4 | 1.36 | 212.7 | 185.1 | 213.2 | 273.4 |
| 8.53 | 299.6 | 3.14 | 867.3 | 213.2 | 983.6 | 1063.9 |
| 11.00 | 301.7 | 3.51 | 1000.8 | 273.4 | 1063.9 | 1229.4 |
| Water | | | | | | |
| 3.79 | 291.1 | 0.97 | 94.4 | 56.1 | 87.1 | 76.3 |
| 7.34 | 254.5 | 1.03 | 56.1 | 106.4 | 79.5 | 71.0 |
| 8.53 | 285.9 | 1.12 | 87.1 | 79.5 | 126.1 | 117.3 |
| 11.00 | 288.2 | 1.09 | 76.3 | 71.0 | 117.3 | 119.8 |
| Arid | | | | | | |
| 3.79 | 321.4 | 3.77 | 1418.6 | 350.3 | -164.7 | 832.2 |
| 7.34 | 259.2 | 2.69 | 350.3 | 726.0 | 330.6 | 475.0 |
| 8.53 | 301.3 | 3.24 | -164.7 | 330.6 | 1047.7 | 357.2 |
| 11.00 | 306.7 | 2.92 | 832.2 | 475.0 | 357.2 | 855.3 |

Figure 3: thresh brightness temp. statistics

| λ | μ | σ | Reflectance Covariance ($\times 10^4$) | | | | | | |
|-----------|-------|----------|--|-------|-------|-------|-------|-------|------|
| KM1 | | | | | | | | | |
| 0.466 | 0.168 | 0.035 | 12.3 | 13.4 | 15.3 | 11.1 | 5.7 | 14.8 | 0.5 |
| 0.554 | 0.170 | 0.041 | 13.4 | 16.8 | 22.0 | 15.7 | 9.4 | 22.0 | 0.7 |
| 0.646 | 0.184 | 0.057 | 15.3 | 22.0 | 32.7 | 20.4 | 14.1 | 31.3 | 1.2 |
| 0.856 | 0.334 | 0.058 | 11.1 | 15.7 | 20.4 | 33.3 | 17.6 | 39.2 | 0.7 |
| 0.936 | 0.170 | 0.036 | 5.7 | 9.4 | 14.1 | 17.6 | 13.3 | 22.8 | 1.0 |
| 1.242 | 0.361 | 0.074 | 14.8 | 22.0 | 31.3 | 39.2 | 22.8 | 54.1 | 1.3 |
| 1.382 | 0.005 | 0.005 | 0.5 | 0.7 | 1.2 | 0.7 | 1.0 | 1.3 | 0.3 |
| KM2 | | | | | | | | | |
| 0.466 | 0.043 | 0.014 | 1.9 | 2.1 | 1.8 | 1.9 | 2.3 | 1.0 | 0.0 |
| 0.554 | 0.027 | 0.016 | 2.1 | 2.5 | 1.8 | 2.0 | 2.7 | 1.2 | 0.0 |
| 0.646 | 0.136 | 0.016 | 1.8 | 1.8 | 2.6 | 1.9 | 1.9 | 0.8 | -0.1 |
| 0.856 | 0.069 | 0.015 | 1.9 | 2.0 | 1.9 | 2.1 | 2.2 | 0.9 | 0.0 |
| 0.936 | 0.018 | 0.018 | 2.3 | 2.7 | 1.9 | 2.2 | 3.1 | 1.3 | 0.0 |
| 1.242 | 0.014 | 0.008 | 1.0 | 1.2 | 0.8 | 0.9 | 1.3 | 0.6 | 0.0 |
| 1.382 | 0.002 | 0.002 | 0.0 | 0.0 | -0.1 | 0.0 | 0.0 | 0.0 | 0.1 |
| KM3 | | | | | | | | | |
| 0.466 | 0.210 | 0.161 | 257.8 | 308.1 | 210.7 | 238.6 | 301.9 | 185.3 | 5.3 |
| 0.554 | 0.229 | 0.194 | 308.1 | 375.5 | 249.0 | 284.6 | 370.1 | 226.1 | 6.7 |
| 0.646 | 0.276 | 0.133 | 210.7 | 249.0 | 175.6 | 195.9 | 243.7 | 149.3 | 4.0 |
| 0.856 | 0.225 | 0.149 | 238.6 | 284.6 | 195.9 | 221.2 | 278.7 | 171.0 | 4.8 |
| 0.936 | 0.228 | 0.193 | 301.9 | 370.1 | 243.7 | 278.7 | 372.0 | 223.3 | 6.7 |
| 1.242 | 0.125 | 0.118 | 185.3 | 226.1 | 149.3 | 171.0 | 223.3 | 138.1 | 4.5 |
| 1.382 | 0.004 | 0.006 | 5.3 | 6.7 | 4.0 | 4.8 | 6.7 | 4.5 | 0.3 |
| KM4 | | | | | | | | | |
| 0.466 | 0.120 | 0.103 | 106.5 | 138.2 | 82.6 | 96.6 | 143.1 | 78.3 | -0.1 |
| 0.554 | 0.130 | 0.139 | 138.2 | 192.6 | 101.1 | 123.8 | 201.5 | 109.2 | 0.7 |
| 0.646 | 0.191 | 0.084 | 82.6 | 101.1 | 70.4 | 77.2 | 104.5 | 56.7 | -0.8 |
| 0.856 | 0.138 | 0.094 | 96.6 | 123.8 | 77.2 | 88.6 | 128.0 | 69.9 | -0.3 |
| 0.936 | 0.127 | 0.147 | 143.1 | 201.5 | 104.5 | 128.0 | 215.0 | 114.3 | 0.8 |
| 1.242 | 0.080 | 0.080 | 78.3 | 109.2 | 56.7 | 69.9 | 114.3 | 63.4 | 1.2 |
| 1.382 | 0.016 | 0.010 | -0.1 | 0.7 | -0.8 | -0.3 | 0.8 | 1.2 | 0.9 |
| KM5 | | | | | | | | | |
| 0.466 | 0.366 | 0.055 | 29.8 | 33.7 | 13.9 | 22.0 | 34.6 | 10.5 | -0.3 |
| 0.554 | 0.476 | 0.064 | 33.7 | 40.6 | 15.9 | 24.9 | 42.0 | 11.5 | -0.5 |
| 0.646 | 0.229 | 0.030 | 13.9 | 15.9 | 9.2 | 12.0 | 15.9 | 3.8 | -0.3 |
| 0.856 | 0.283 | 0.042 | 22.0 | 24.9 | 12.0 | 17.8 | 25.1 | 7.5 | -0.3 |
| 0.936 | 0.561 | 0.071 | 34.6 | 42.0 | 15.9 | 25.1 | 49.8 | 12.8 | -0.5 |
| 1.242 | 0.251 | 0.033 | 10.5 | 11.5 | 3.8 | 7.5 | 12.8 | 10.9 | 0.4 |
| 1.382 | 0.005 | 0.003 | -0.3 | -0.5 | -0.3 | -0.3 | -0.5 | 0.4 | 0.1 |

Figure 4: km reflectance statistics

| λ | μ | σ | Brightness Temp. Covariance ($\times 10^2$) | | | |
|-----------|-------|----------|---|-------|---------|---------|
| KM1 | | | | | | |
| 3.79 | 312.6 | 4.23 | 1793.4 | 395.7 | 1422.1 | 1661.1 |
| 7.34 | 256.0 | 1.79 | 395.7 | 319.0 | 470.3 | 586.3 |
| 8.53 | 298.1 | 4.63 | 1422.1 | 470.3 | 2146.3 | 2363.0 |
| 11.00 | 300.0 | 5.20 | 1661.1 | 586.3 | 2363.0 | 2704.1 |
| KM2 | | | | | | |
| 3.79 | 292.1 | 2.01 | 404.0 | 60.5 | 94.8 | 83.7 |
| 7.34 | 254.5 | 1.12 | 60.5 | 126.4 | 114.8 | 107.6 |
| 8.53 | 285.8 | 1.51 | 94.8 | 114.8 | 228.1 | 223.0 |
| 11.00 | 287.9 | 1.53 | 83.7 | 107.6 | 223.0 | 233.9 |
| KM3 | | | | | | |
| 3.79 | 303.5 | 5.72 | 3276.2 | 110.1 | -959.3 | -1048.7 |
| 7.34 | 254.0 | 1.39 | 110.1 | 193.1 | 311.5 | 332.5 |
| 8.53 | 281.8 | 4.22 | -959.3 | 311.5 | 1777.6 | 1873.9 |
| 11.00 | 284.0 | 4.48 | -1048.7 | 332.5 | 1873.9 | 2009.4 |
| KM4 | | | | | | |
| 3.79 | 296.2 | 7.35 | 5405.7 | 478.3 | -1124.8 | -932.1 |
| 7.34 | 252.1 | 2.17 | 478.3 | 469.9 | 459.4 | 596.8 |
| 8.53 | 280.6 | 4.90 | -1124.8 | 459.4 | 2404.9 | 2440.2 |
| 11.00 | 281.5 | 5.06 | -932.1 | 596.8 | 2440.2 | 2563.5 |
| KM5 | | | | | | |
| 3.79 | 322.0 | 3.55 | 1257.1 | 272.8 | -185.0 | 741.5 |
| 7.34 | 259.4 | 2.66 | 272.8 | 709.5 | 412.8 | 470.0 |
| 8.53 | 301.3 | 3.45 | -185.0 | 412.8 | 1192.0 | 460.9 |
| 11.00 | 307.0 | 3.03 | 741.5 | 470.0 | 460.9 | 918.3 |

Figure 5: km brightness temp. statistics

| | Ice Cloud | Water Cloud | Vegetation | Water | Arid | Cons. Acc. |
|------------|-----------|-------------|------------|-------|-------|------------|
| KM1 | 766 | 0 | 35940 | 0 | 8023 | 0.804 |
| KM2 | 0 | 0 | 195 | 96348 | 79 | 0.997 |
| KM3 | 518 | 2213 | 326 | 0 | 5 | 0.723 |
| KM4 | 8736 | 12 | 0 | 382 | 0 | 0.957 |
| KM5 | 74 | 2 | 153 | 0 | 60815 | 0.996 |
| Prod. Acc. | 0.865 | 0.994 | 0.982 | 0.996 | 0.882 | |

Figure 6: km/thresh confusion matrix

| λ | μ | σ | Reflectance Covariance ($\times 10^4$) | | | | | | |
|-------------|-------|----------|--|-------|-------|-------|-------|-------|------|
| Ice Cloud | | | | | | | | | |
| 0.466 | 0.210 | 0.100 | 99.5 | 106.9 | 113.7 | 126.1 | 79.8 | 122.4 | 0.0 |
| 0.554 | 0.172 | 0.112 | 106.9 | 124.6 | 138.7 | 168.7 | 103.6 | 168.5 | 0.3 |
| 0.646 | 0.164 | 0.126 | 113.7 | 138.7 | 158.5 | 199.1 | 120.8 | 202.2 | 0.4 |
| 0.856 | 0.201 | 0.167 | 126.1 | 168.7 | 199.1 | 281.1 | 167.1 | 295.0 | 1.4 |
| 0.936 | 0.131 | 0.101 | 79.8 | 103.6 | 120.8 | 167.1 | 101.4 | 174.4 | 1.1 |
| 1.242 | 0.203 | 0.179 | 122.4 | 168.5 | 202.2 | 295.0 | 174.4 | 321.5 | 1.5 |
| 1.382 | 0.029 | 0.008 | 0.0 | 0.3 | 0.4 | 1.4 | 1.1 | 1.5 | 0.6 |
| Water Cloud | | | | | | | | | |
| 0.466 | 0.564 | 0.094 | 89.2 | 82.8 | 87.2 | 87.3 | 66.0 | 47.4 | -0.4 |
| 0.554 | 0.645 | 0.092 | 82.8 | 85.4 | 78.3 | 80.7 | 72.0 | 52.2 | 0.5 |
| 0.646 | 0.570 | 0.094 | 87.2 | 78.3 | 89.1 | 86.8 | 61.0 | 42.3 | -1.0 |
| 0.856 | 0.553 | 0.093 | 87.3 | 80.7 | 86.8 | 86.2 | 63.9 | 45.7 | -0.5 |
| 0.936 | 0.635 | 0.085 | 66.0 | 72.0 | 61.0 | 63.9 | 72.6 | 46.0 | 0.9 |
| 1.242 | 0.372 | 0.062 | 47.4 | 52.2 | 42.3 | 45.7 | 46.0 | 38.3 | 1.4 |
| 1.382 | 0.009 | 0.006 | -0.4 | 0.5 | -1.0 | -0.5 | 0.9 | 1.4 | 0.3 |
| Vegetation | | | | | | | | | |
| 0.466 | 0.152 | 0.033 | 10.8 | 8.4 | 4.8 | 7.0 | 15.1 | 5.4 | 0.3 |
| 0.554 | 0.314 | 0.056 | 8.4 | 31.2 | 4.9 | 7.7 | 33.6 | 13.5 | 0.0 |
| 0.646 | 0.152 | 0.021 | 4.8 | 4.9 | 4.6 | 4.6 | 7.4 | 0.9 | -0.0 |
| 0.856 | 0.147 | 0.024 | 7.0 | 7.7 | 4.6 | 5.7 | 11.5 | 3.3 | 0.1 |
| 0.936 | 0.330 | 0.067 | 15.1 | 33.6 | 7.4 | 11.5 | 44.7 | 16.2 | 0.3 |
| 1.242 | 0.153 | 0.030 | 5.4 | 13.5 | 0.9 | 3.3 | 16.2 | 8.7 | 0.3 |
| 1.382 | 0.003 | 0.003 | 0.3 | 0.0 | -0.0 | 0.1 | 0.3 | 0.3 | 0.1 |
| Water | | | | | | | | | |
| 0.466 | 0.036 | 0.004 | 0.2 | 0.1 | 0.3 | 0.3 | 0.1 | 0.1 | 0.0 |
| 0.554 | 0.018 | 0.004 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.0 |
| 0.646 | 0.131 | 0.010 | 0.3 | 0.2 | 1.1 | 0.5 | 0.1 | 0.0 | -0.0 |
| 0.856 | 0.062 | 0.007 | 0.3 | 0.1 | 0.5 | 0.5 | 0.1 | 0.1 | 0.0 |
| 0.936 | 0.009 | 0.004 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 |
| 1.242 | 0.010 | 0.002 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 |
| 1.382 | 0.002 | 0.002 | 0.0 | 0.0 | -0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Arid | | | | | | | | | |
| 0.466 | 0.349 | 0.061 | 37.3 | 41.6 | 16.5 | 26.5 | 47.5 | 14.6 | -0.4 |
| 0.554 | 0.459 | 0.071 | 41.6 | 49.9 | 18.5 | 29.6 | 56.9 | 16.4 | -0.6 |
| 0.646 | 0.222 | 0.031 | 16.5 | 18.5 | 9.4 | 13.1 | 20.8 | 4.6 | -0.3 |
| 0.856 | 0.271 | 0.045 | 26.5 | 29.6 | 13.1 | 20.1 | 33.4 | 9.7 | -0.3 |
| 0.936 | 0.539 | 0.085 | 47.5 | 56.9 | 20.8 | 33.4 | 71.6 | 20.1 | -0.6 |
| 1.242 | 0.240 | 0.037 | 14.6 | 16.4 | 4.6 | 9.7 | 20.1 | 13.7 | 0.4 |
| 1.382 | 0.005 | 0.003 | -0.4 | -0.6 | -0.3 | -0.3 | -0.6 | 0.4 | 0.1 |

Figure 7: samples thresh reflectance statistics

| λ | μ | σ | Brightness Temp. Covariance ($\times 10^2$) | | | |
|-------------|-------|----------|---|-------|--------|--------|
| Ice Cloud | | | | | | |
| 3.79 | 297.0 | 8.04 | 6484.6 | 688.3 | 18.0 | 410.4 |
| 7.34 | 249.6 | 2.09 | 688.3 | 438.8 | 181.6 | 358.7 |
| 8.53 | 277.3 | 6.86 | 18.0 | 181.6 | 4712.9 | 4547.5 |
| 11.00 | 277.4 | 6.72 | 410.4 | 358.7 | 4547.5 | 4533.0 |
| Water Cloud | | | | | | |
| 3.79 | 313.6 | 3.07 | 942.3 | 216.7 | 341.8 | 380.8 |
| 7.34 | 254.2 | 1.35 | 216.7 | 183.3 | 242.5 | 280.3 |
| 8.53 | 276.9 | 2.62 | 341.8 | 242.5 | 687.8 | 714.4 |
| 11.00 | 278.8 | 2.79 | 380.8 | 280.3 | 714.4 | 781.0 |
| Vegetation | | | | | | |
| 3.79 | 312.6 | 3.47 | 1210.5 | 273.0 | 844.8 | 1020.5 |
| 7.34 | 256.4 | 1.44 | 273.0 | 209.3 | 253.8 | 336.3 |
| 8.53 | 299.5 | 3.04 | 844.8 | 253.8 | 925.8 | 1022.5 |
| 11.00 | 301.7 | 3.50 | 1020.5 | 336.3 | 1022.5 | 1226.4 |
| Water | | | | | | |
| 3.79 | 291.1 | 0.97 | 94.3 | 60.7 | 87.6 | 77.9 |
| 7.34 | 254.5 | 1.05 | 60.7 | 110.1 | 84.9 | 77.8 |
| 8.53 | 286.0 | 1.12 | 87.6 | 84.9 | 126.2 | 118.8 |
| 11.00 | 288.2 | 1.11 | 77.9 | 77.8 | 118.8 | 123.0 |
| Arid | | | | | | |
| 3.79 | 321.1 | 3.80 | 1450.6 | 389.8 | -108.0 | 836.4 |
| 7.34 | 258.9 | 2.81 | 389.8 | 792.3 | 366.1 | 493.1 |
| 8.53 | 301.6 | 3.35 | -108.0 | 366.1 | 1123.1 | 424.3 |
| 11.00 | 306.6 | 2.93 | 836.4 | 493.1 | 424.3 | 859.3 |

Figure 8: samples thresh brightness temp. statistics

| λ | μ | σ | Reflectance Covariance ($\times 10^4$) | | | | | | |
|-------------|-------|----------|--|-------|-------|-------|-------|-------|------|
| Ice Cloud | | | | | | | | | |
| 0.466 | 0.187 | 0.059 | 34.3 | 37.7 | 40.7 | 50.9 | 29.4 | 54.3 | 0.3 |
| 0.554 | 0.132 | 0.069 | 37.7 | 47.3 | 54.2 | 75.0 | 43.8 | 81.4 | 1.2 |
| 0.646 | 0.115 | 0.080 | 40.7 | 54.2 | 63.9 | 91.2 | 53.5 | 100.0 | 1.8 |
| 0.856 | 0.125 | 0.119 | 50.9 | 75.0 | 91.2 | 141.8 | 82.9 | 156.7 | 3.3 |
| 0.936 | 0.072 | 0.070 | 29.4 | 43.8 | 53.5 | 82.9 | 49.7 | 91.5 | 2.7 |
| 1.242 | 0.126 | 0.132 | 54.3 | 81.4 | 100.0 | 156.7 | 91.5 | 175.2 | 3.5 |
| 1.382 | 0.009 | 0.010 | 0.3 | 1.2 | 1.8 | 3.3 | 2.7 | 3.5 | 1.0 |
| Water Cloud | | | | | | | | | |
| 0.466 | 0.442 | 0.121 | 147.5 | 149.5 | 134.3 | 141.1 | 131.9 | 91.8 | 1.8 |
| 0.554 | 0.522 | 0.130 | 149.5 | 168.8 | 129.2 | 141.6 | 154.0 | 107.3 | 3.3 |
| 0.646 | 0.461 | 0.112 | 134.3 | 129.2 | 126.4 | 129.6 | 110.9 | 77.1 | 0.8 |
| 0.856 | 0.438 | 0.116 | 141.1 | 141.6 | 129.6 | 135.4 | 123.9 | 86.4 | 1.5 |
| 0.936 | 0.528 | 0.122 | 131.9 | 154.0 | 110.9 | 123.9 | 148.6 | 99.8 | 3.6 |
| 1.242 | 0.297 | 0.085 | 91.8 | 107.3 | 77.1 | 86.4 | 99.8 | 72.4 | 3.0 |
| 1.382 | 0.008 | 0.006 | 1.8 | 3.3 | 0.8 | 1.5 | 3.6 | 3.0 | 0.4 |
| Vegetation | | | | | | | | | |
| 0.466 | 0.159 | 0.039 | 15.0 | 11.3 | 6.7 | 9.9 | 18.8 | 6.9 | 0.5 |
| 0.554 | 0.321 | 0.056 | 11.3 | 31.2 | 5.8 | 9.2 | 35.3 | 14.6 | 0.2 |
| 0.646 | 0.156 | 0.024 | 6.7 | 5.8 | 5.6 | 5.9 | 8.6 | 1.6 | 0.1 |
| 0.856 | 0.153 | 0.027 | 9.9 | 9.2 | 5.9 | 7.6 | 13.6 | 4.4 | 0.2 |
| 0.936 | 0.340 | 0.069 | 18.8 | 35.3 | 8.6 | 13.6 | 46.9 | 18.2 | 0.6 |
| 1.242 | 0.158 | 0.032 | 6.9 | 14.6 | 1.6 | 4.4 | 18.2 | 10.0 | 0.5 |
| 1.382 | 0.003 | 0.004 | 0.5 | 0.2 | 0.1 | 0.2 | 0.6 | 0.5 | 0.1 |
| Water | | | | | | | | | |
| 0.466 | 0.038 | 0.006 | 0.3 | 0.3 | 0.4 | 0.4 | 0.3 | 0.2 | 0.0 |
| 0.554 | 0.021 | 0.006 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.2 | 0.1 |
| 0.646 | 0.131 | 0.011 | 0.4 | 0.3 | 1.2 | 0.6 | 0.2 | 0.1 | -0.0 |
| 0.856 | 0.064 | 0.007 | 0.4 | 0.3 | 0.6 | 0.5 | 0.3 | 0.1 | 0.0 |
| 0.936 | 0.012 | 0.006 | 0.3 | 0.4 | 0.2 | 0.3 | 0.4 | 0.2 | 0.1 |
| 1.242 | 0.012 | 0.004 | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 |
| 1.382 | 0.003 | 0.003 | 0.0 | 0.1 | -0.0 | 0.0 | 0.1 | 0.1 | 0.1 |
| Arid | | | | | | | | | |
| 0.466 | 0.355 | 0.061 | 37.1 | 41.9 | 17.0 | 27.2 | 45.9 | 15.0 | -0.4 |
| 0.554 | 0.464 | 0.071 | 41.9 | 49.8 | 19.2 | 30.6 | 54.8 | 16.8 | -0.5 |
| 0.646 | 0.224 | 0.031 | 17.0 | 19.2 | 9.8 | 13.9 | 20.8 | 5.4 | -0.3 |
| 0.856 | 0.275 | 0.046 | 27.2 | 30.6 | 13.9 | 21.2 | 33.3 | 10.5 | -0.4 |
| 0.936 | 0.546 | 0.082 | 45.9 | 54.8 | 20.8 | 33.3 | 66.9 | 19.8 | -0.5 |
| 1.242 | 0.245 | 0.036 | 15.0 | 16.8 | 5.4 | 10.5 | 19.8 | 13.3 | 0.3 |
| 1.382 | 0.005 | 0.003 | -0.4 | -0.5 | -0.3 | -0.4 | -0.5 | 0.3 | 0.1 |

Figure 9: mlc thresh reflectance statistics

| λ | μ | σ | Brightness Temp. Covariance ($\times 10^2$) | | | |
|-------------|-------|----------|---|-------|--------|--------|
| Ice Cloud | | | | | | |
| 3.79 | 297.7 | 6.38 | 4068.9 | 332.0 | 262.8 | 305.2 |
| 7.34 | 253.1 | 2.04 | 332.0 | 416.3 | 501.6 | 645.5 |
| 8.53 | 282.8 | 4.88 | 262.8 | 501.6 | 2384.7 | 2467.6 |
| 11.00 | 284.2 | 5.15 | 305.2 | 645.5 | 2467.6 | 2652.6 |
| Water Cloud | | | | | | |
| 3.79 | 312.6 | 2.79 | 775.9 | 150.9 | 200.9 | 179.8 |
| 7.34 | 254.2 | 1.29 | 150.9 | 166.1 | 271.4 | 292.2 |
| 8.53 | 278.8 | 3.38 | 200.9 | 271.4 | 1143.4 | 1106.7 |
| 11.00 | 280.6 | 3.35 | 179.8 | 292.2 | 1106.7 | 1119.1 |
| Vegetation | | | | | | |
| 3.79 | 312.0 | 4.04 | 1634.5 | 320.6 | 1293.6 | 1486.3 |
| 7.34 | 256.1 | 1.38 | 320.6 | 189.6 | 344.3 | 408.9 |
| 8.53 | 298.7 | 3.88 | 1293.6 | 344.3 | 1502.7 | 1671.5 |
| 11.00 | 300.6 | 4.39 | 1486.3 | 408.9 | 1671.5 | 1926.1 |
| Water | | | | | | |
| 3.79 | 291.3 | 1.09 | 117.8 | 47.3 | 74.1 | 57.0 |
| 7.34 | 254.4 | 1.07 | 47.3 | 114.9 | 90.8 | 87.3 |
| 8.53 | 285.8 | 1.20 | 74.1 | 90.8 | 144.7 | 145.0 |
| 11.00 | 287.9 | 1.28 | 57.0 | 87.3 | 145.0 | 163.5 |
| Arid | | | | | | |
| 3.79 | 321.5 | 3.72 | 1386.7 | 355.0 | -158.1 | 827.1 |
| 7.34 | 259.2 | 2.72 | 355.0 | 739.6 | 343.6 | 478.9 |
| 8.53 | 301.4 | 3.28 | -158.1 | 343.6 | 1078.8 | 377.2 |
| 11.00 | 306.8 | 2.94 | 827.1 | 478.9 | 377.2 | 863.8 |

Figure 10: mlc thresh brightness temp. statistics

| | Ice Cloud | Water Cloud | Vegetation | Water | Arid | Uncertain | Cons. Acc. |
|-----------------|-----------|-------------|------------|-------|-------|-----------|------------|
| MLC Ice Cloud | 372 | 4 | 0 | 0 | 0 | 17 | 0.947 |
| MLC Water Cloud | 2 | 361 | 0 | 0 | 0 | 6 | 0.978 |
| MLC Vegetation | 1 | 0 | 387 | 0 | 5 | 4 | 0.975 |
| MLC Water | 0 | 0 | 0 | 395 | 0 | 4 | 0.990 |
| MLC Arid | 0 | 0 | 9 | 0 | 385 | 5 | 0.965 |
| Prod. Acc. | 0.992 | 0.989 | 0.977 | 1.000 | 0.987 | | |

Figure 11: samples thresh/mlc thresh confusion matrix

| λ | μ | σ | Reflectance Covariance ($\times 10^4$) | | | | | | | |
|-----------|-------|----------|---|--------|--------|-------|--------|-------|-----|--|
| 0.466 | 0.145 | 0.121 | 147.0 | 200.1 | 83.0 | 115.5 | 204.5 | 109.3 | 4.1 | |
| 0.554 | 0.171 | 0.174 | 200.1 | 302.4 | 107.4 | 154.8 | 316.6 | 163.6 | 5.7 | |
| 0.646 | 0.191 | 0.078 | 83.0 | 107.4 | 60.1 | 70.5 | 104.4 | 59.7 | 2.1 | |
| 0.856 | 0.159 | 0.097 | 115.5 | 154.8 | 70.5 | 94.3 | 155.0 | 85.0 | 3.2 | |
| 0.936 | 0.170 | 0.187 | 204.5 | 316.6 | 104.4 | 155.0 | 348.6 | 169.9 | 5.8 | |
| 1.242 | 0.088 | 0.095 | 109.3 | 163.6 | 59.7 | 85.0 | 169.9 | 91.0 | 3.6 | |
| 1.382 | 0.005 | 0.008 | 4.1 | 5.7 | 2.1 | 3.2 | 5.8 | 3.6 | 0.6 | |
| λ | μ | σ | Brightness Temp. Covariance ($\times 10^2$) | | | | | | | |
| 3.79 | 301.3 | 9.38 | 8802.7 | 881.8 | 3530.7 | | 3898.1 | | | |
| 7.34 | 254.8 | 2.59 | 881.8 | 673.2 | 1113.9 | | 1227.8 | | | |
| 8.53 | 288.2 | 6.16 | 3530.7 | 1113.9 | 3790.0 | | 4043.4 | | | |
| 11.00 | 290.6 | 6.69 | 3898.1 | 1227.8 | 4043.4 | | 4480.2 | | | |

Figure 12: mlc thresh Uncertain reflectance and brightness temp. statistics

| λ | μ | σ | Reflectance Covariance ($\times 10^4$) | | | | | | |
|-----------|-------|----------|--|-------|-------|-------|-------|-------|------|
| KM1 | | | | | | | | | |
| 0.466 | 0.168 | 0.035 | 12.2 | 13.5 | 15.3 | 11.1 | 6.2 | 15.0 | 0.6 |
| 0.554 | 0.169 | 0.041 | 13.5 | 17.0 | 21.8 | 15.5 | 9.9 | 21.9 | 0.9 |
| 0.646 | 0.183 | 0.057 | 15.3 | 21.8 | 32.2 | 20.5 | 14.8 | 31.5 | 1.6 |
| 0.856 | 0.331 | 0.059 | 11.1 | 15.5 | 20.5 | 34.8 | 19.4 | 41.1 | 1.1 |
| 0.936 | 0.168 | 0.038 | 6.2 | 9.9 | 14.8 | 19.4 | 14.5 | 25.1 | 1.2 |
| 1.242 | 0.356 | 0.075 | 15.0 | 21.9 | 31.5 | 41.1 | 25.1 | 56.1 | 1.8 |
| 1.382 | 0.005 | 0.005 | 0.6 | 0.9 | 1.6 | 1.1 | 1.2 | 1.8 | 0.3 |
| KM2 | | | | | | | | | |
| 0.466 | 0.043 | 0.013 | 1.8 | 2.1 | 1.7 | 1.8 | 2.1 | 1.0 | 0.0 |
| 0.554 | 0.027 | 0.016 | 2.1 | 2.4 | 1.7 | 2.0 | 2.5 | 1.2 | 0.0 |
| 0.646 | 0.136 | 0.016 | 1.7 | 1.7 | 2.4 | 1.8 | 1.7 | 0.8 | -0.0 |
| 0.856 | 0.069 | 0.014 | 1.8 | 2.0 | 1.8 | 1.9 | 2.0 | 0.9 | 0.0 |
| 0.936 | 0.018 | 0.016 | 2.1 | 2.5 | 1.7 | 2.0 | 2.7 | 1.2 | 0.1 |
| 1.242 | 0.014 | 0.008 | 1.0 | 1.2 | 0.8 | 0.9 | 1.2 | 0.6 | 0.1 |
| 1.382 | 0.002 | 0.002 | 0.0 | 0.0 | -0.0 | 0.0 | 0.1 | 0.1 | 0.1 |
| KM3 | | | | | | | | | |
| 0.466 | 0.223 | 0.169 | 285.6 | 341.1 | 232.2 | 264.5 | 326.0 | 208.9 | 7.0 |
| 0.554 | 0.243 | 0.203 | 341.1 | 414.5 | 275.0 | 315.6 | 400.5 | 254.1 | 8.6 |
| 0.646 | 0.287 | 0.138 | 232.2 | 275.0 | 192.0 | 215.8 | 262.9 | 167.8 | 5.3 |
| 0.856 | 0.237 | 0.156 | 264.5 | 315.6 | 215.8 | 245.4 | 301.4 | 193.1 | 6.4 |
| 0.936 | 0.241 | 0.200 | 326.0 | 400.5 | 262.9 | 301.4 | 400.4 | 245.6 | 8.2 |
| 1.242 | 0.134 | 0.125 | 208.9 | 254.1 | 167.8 | 193.1 | 245.6 | 157.8 | 5.7 |
| 1.382 | 0.005 | 0.006 | 7.0 | 8.6 | 5.3 | 6.4 | 8.2 | 5.7 | 0.4 |
| KM4 | | | | | | | | | |
| 0.466 | 0.123 | 0.103 | 107.0 | 139.1 | 80.3 | 96.2 | 137.9 | 78.5 | -0.4 |
| 0.554 | 0.134 | 0.140 | 139.1 | 195.4 | 98.3 | 123.4 | 197.9 | 111.2 | 0.6 |
| 0.646 | 0.191 | 0.082 | 80.3 | 98.3 | 66.7 | 74.4 | 97.7 | 54.4 | -1.2 |
| 0.856 | 0.140 | 0.093 | 96.2 | 123.4 | 74.4 | 87.4 | 122.3 | 69.2 | -0.6 |
| 0.936 | 0.129 | 0.144 | 137.9 | 197.9 | 97.7 | 122.3 | 207.7 | 112.5 | 0.8 |
| 1.242 | 0.082 | 0.080 | 78.5 | 111.2 | 54.4 | 69.2 | 112.5 | 64.7 | 1.1 |
| 1.382 | 0.016 | 0.010 | -0.4 | 0.6 | -1.2 | -0.6 | 0.8 | 1.1 | 1.0 |
| KM5 | | | | | | | | | |
| 0.466 | 0.369 | 0.057 | 32.1 | 36.7 | 14.8 | 23.6 | 36.3 | 11.7 | -0.3 |
| 0.554 | 0.480 | 0.067 | 36.7 | 44.4 | 16.9 | 26.9 | 44.4 | 13.0 | -0.5 |
| 0.646 | 0.231 | 0.030 | 14.8 | 16.9 | 9.2 | 12.5 | 16.3 | 4.1 | -0.2 |
| 0.856 | 0.286 | 0.043 | 23.6 | 26.9 | 12.5 | 18.8 | 26.2 | 8.1 | -0.3 |
| 0.936 | 0.565 | 0.071 | 36.3 | 44.4 | 16.3 | 26.2 | 50.4 | 13.4 | -0.6 |
| 1.242 | 0.253 | 0.035 | 11.7 | 13.0 | 4.1 | 8.1 | 13.4 | 12.0 | 0.4 |
| 1.382 | 0.005 | 0.004 | -0.3 | -0.5 | -0.2 | -0.3 | -0.6 | 0.4 | 0.1 |

Figure 13: samples km reflectance statistics

| λ | μ | σ | Brightness Temp. Covariance ($\times 10^2$) | | | |
|-----------|-------|----------|---|-------|--------|---------|
| KM1 | | | | | | |
| 3.79 | 312.7 | 4.10 | 1685.3 | 314.2 | 1303.2 | 1523.8 |
| 7.34 | 256.0 | 1.73 | 314.2 | 300.9 | 410.4 | 525.2 |
| 8.53 | 298.1 | 4.64 | 1303.2 | 410.4 | 2158.9 | 2360.5 |
| 11.00 | 300.0 | 5.18 | 1523.8 | 525.2 | 2360.5 | 2689.2 |
| KM2 | | | | | | |
| 3.79 | 292.0 | 2.01 | 406.1 | 58.5 | 89.6 | 76.4 |
| 7.34 | 254.5 | 1.06 | 58.5 | 112.2 | 96.9 | 89.4 |
| 8.53 | 285.7 | 1.41 | 89.6 | 96.9 | 198.8 | 194.2 |
| 11.00 | 287.8 | 1.43 | 76.4 | 89.4 | 194.2 | 205.7 |
| KM3 | | | | | | |
| 3.79 | 303.7 | 5.85 | 3428.4 | 103.2 | -941.2 | -1023.6 |
| 7.34 | 253.9 | 1.42 | 103.2 | 202.4 | 354.6 | 382.2 |
| 8.53 | 281.4 | 4.28 | -941.2 | 354.6 | 1836.7 | 1961.1 |
| 11.00 | 283.6 | 4.60 | -1023.6 | 382.2 | 1961.1 | 2123.0 |
| KM4 | | | | | | |
| 3.79 | 296.2 | 7.20 | 5201.2 | 533.0 | -853.1 | -646.2 |
| 7.34 | 252.0 | 2.21 | 533.0 | 489.8 | 455.0 | 599.3 |
| 8.53 | 280.6 | 4.49 | -853.1 | 455.0 | 2019.8 | 2082.2 |
| 11.00 | 281.5 | 4.72 | -646.2 | 599.3 | 2082.2 | 2234.2 |
| KM5 | | | | | | |
| 3.79 | 322.0 | 3.63 | 1321.8 | 270.2 | -203.2 | 767.7 |
| 7.34 | 259.5 | 2.79 | 270.2 | 782.2 | 489.4 | 516.5 |
| 8.53 | 301.0 | 3.56 | -203.2 | 489.4 | 1270.3 | 480.4 |
| 11.00 | 306.9 | 3.08 | 767.7 | 516.5 | 480.4 | 953.2 |

Figure 14: samples km brightness temp. statistics

| λ | μ | σ | Reflectance Covariance ($\times 10^4$) | | | | | | |
|-----------|-------|----------|--|-------|-------|-------|-------|-------|------|
| KM1 | | | | | | | | | |
| 0.466 | 0.167 | 0.033 | 10.7 | 12.0 | 14.4 | 10.9 | 5.6 | 15.0 | 0.5 |
| 0.554 | 0.169 | 0.040 | 12.0 | 15.9 | 21.7 | 16.4 | 9.8 | 23.3 | 0.8 |
| 0.646 | 0.184 | 0.058 | 14.4 | 21.7 | 33.4 | 22.2 | 15.2 | 34.1 | 1.3 |
| 0.856 | 0.335 | 0.059 | 10.9 | 16.4 | 22.2 | 34.8 | 18.5 | 41.7 | 0.7 |
| 0.936 | 0.170 | 0.037 | 5.6 | 9.8 | 15.2 | 18.5 | 13.7 | 24.2 | 1.0 |
| 1.242 | 0.362 | 0.076 | 15.0 | 23.3 | 34.1 | 41.7 | 24.2 | 57.2 | 1.3 |
| 1.382 | 0.005 | 0.005 | 0.5 | 0.8 | 1.3 | 0.7 | 1.0 | 1.3 | 0.3 |
| KM2 | | | | | | | | | |
| 0.466 | 0.042 | 0.013 | 1.6 | 1.7 | 1.6 | 1.6 | 1.9 | 0.8 | 0.0 |
| 0.554 | 0.026 | 0.014 | 1.7 | 2.0 | 1.6 | 1.6 | 2.1 | 1.0 | 0.1 |
| 0.646 | 0.136 | 0.016 | 1.6 | 1.6 | 2.5 | 1.8 | 1.7 | 0.7 | -0.1 |
| 0.856 | 0.068 | 0.013 | 1.6 | 1.6 | 1.8 | 1.7 | 1.8 | 0.8 | 0.0 |
| 0.936 | 0.018 | 0.015 | 1.9 | 2.1 | 1.7 | 1.8 | 2.4 | 1.1 | 0.1 |
| 1.242 | 0.014 | 0.007 | 0.8 | 1.0 | 0.7 | 0.8 | 1.1 | 0.5 | 0.1 |
| 1.382 | 0.003 | 0.003 | 0.0 | 0.1 | -0.1 | 0.0 | 0.1 | 0.1 | 0.1 |
| KM3 | | | | | | | | | |
| 0.466 | 0.206 | 0.147 | 216.6 | 262.0 | 180.4 | 200.1 | 263.1 | 154.1 | 3.8 |
| 0.554 | 0.223 | 0.179 | 262.0 | 321.7 | 216.0 | 241.6 | 324.2 | 190.0 | 4.9 |
| 0.646 | 0.272 | 0.124 | 180.4 | 216.0 | 152.9 | 167.1 | 216.4 | 126.3 | 2.9 |
| 0.856 | 0.221 | 0.136 | 200.1 | 241.6 | 167.1 | 185.1 | 242.2 | 141.9 | 3.4 |
| 0.936 | 0.224 | 0.182 | 263.1 | 324.2 | 216.4 | 242.2 | 331.2 | 191.9 | 5.0 |
| 1.242 | 0.120 | 0.107 | 154.1 | 190.0 | 126.3 | 141.9 | 191.9 | 113.8 | 3.2 |
| 1.382 | 0.003 | 0.005 | 3.8 | 4.9 | 2.9 | 3.4 | 5.0 | 3.2 | 0.2 |
| KM4 | | | | | | | | | |
| 0.466 | 0.120 | 0.089 | 79.9 | 114.6 | 58.7 | 71.7 | 121.9 | 66.7 | -0.1 |
| 0.554 | 0.132 | 0.132 | 114.6 | 175.4 | 78.7 | 101.5 | 187.5 | 101.2 | 0.1 |
| 0.646 | 0.190 | 0.070 | 58.7 | 78.7 | 48.8 | 54.6 | 83.8 | 45.9 | -0.5 |
| 0.856 | 0.138 | 0.081 | 71.7 | 101.5 | 54.6 | 65.2 | 108.0 | 59.0 | -0.2 |
| 0.936 | 0.131 | 0.142 | 121.9 | 187.5 | 83.8 | 108.0 | 202.1 | 108.0 | -0.1 |
| 1.242 | 0.084 | 0.077 | 66.7 | 101.2 | 45.9 | 59.0 | 108.0 | 59.3 | 0.6 |
| 1.382 | 0.018 | 0.009 | -0.1 | 0.1 | -0.5 | -0.2 | -0.1 | 0.6 | 0.9 |
| KM5 | | | | | | | | | |
| 0.466 | 0.367 | 0.054 | 29.6 | 34.7 | 13.9 | 22.0 | 35.2 | 10.4 | -0.4 |
| 0.554 | 0.476 | 0.065 | 34.7 | 42.3 | 16.3 | 25.6 | 43.6 | 11.9 | -0.6 |
| 0.646 | 0.229 | 0.029 | 13.9 | 16.3 | 8.5 | 11.7 | 16.4 | 3.7 | -0.3 |
| 0.856 | 0.283 | 0.042 | 22.0 | 25.6 | 11.7 | 17.6 | 25.8 | 7.4 | -0.4 |
| 0.936 | 0.562 | 0.071 | 35.2 | 43.6 | 16.4 | 25.8 | 51.1 | 13.0 | -0.5 |
| 1.242 | 0.251 | 0.033 | 10.4 | 11.9 | 3.7 | 7.4 | 13.0 | 11.0 | 0.4 |
| 1.382 | 0.005 | 0.003 | -0.4 | -0.6 | -0.3 | -0.4 | -0.5 | 0.4 | 0.1 |

Figure 15: mlc km reflectance statistics

| λ | μ | σ | Brightness Temp. Covariance ($\times 10^2$) | | | |
|-----------|-------|----------|---|-------|---------|---------|
| KM1 | | | | | | |
| 3.79 | 312.7 | 4.55 | 2073.3 | 447.9 | 1684.4 | 1947.3 |
| 7.34 | 255.9 | 1.76 | 447.9 | 308.2 | 541.8 | 657.6 |
| 8.53 | 298.2 | 4.81 | 1684.4 | 541.8 | 2317.0 | 2579.9 |
| 11.00 | 300.1 | 5.44 | 1947.3 | 657.6 | 2579.9 | 2957.5 |
| KM2 | | | | | | |
| 3.79 | 291.9 | 1.68 | 281.2 | 26.2 | 16.1 | 2.0 |
| 7.34 | 254.3 | 1.12 | 26.2 | 126.0 | 104.7 | 102.4 |
| 8.53 | 285.5 | 1.33 | 16.1 | 104.7 | 176.4 | 178.0 |
| 11.00 | 287.6 | 1.42 | 2.0 | 102.4 | 178.0 | 201.0 |
| KM3 | | | | | | |
| 3.79 | 303.6 | 5.89 | 3464.0 | 22.8 | -1246.9 | -1344.6 |
| 7.34 | 254.3 | 1.32 | 22.8 | 173.9 | 311.9 | 317.7 |
| 8.53 | 282.5 | 4.08 | -1246.9 | 311.9 | 1663.4 | 1712.0 |
| 11.00 | 284.7 | 4.23 | -1344.6 | 317.7 | 1712.0 | 1787.1 |
| KM4 | | | | | | |
| 3.79 | 296.6 | 7.48 | 5598.9 | 742.4 | -849.9 | -645.4 |
| 7.34 | 251.6 | 2.27 | 742.4 | 514.4 | 530.5 | 680.7 |
| 8.53 | 279.6 | 5.29 | -849.9 | 530.5 | 2798.8 | 2840.6 |
| 11.00 | 280.2 | 5.44 | -645.4 | 680.7 | 2840.6 | 2964.9 |
| KM5 | | | | | | |
| 3.79 | 321.9 | 3.61 | 1302.8 | 265.5 | -195.0 | 753.4 |
| 7.34 | 259.5 | 2.65 | 265.5 | 704.8 | 417.3 | 449.5 |
| 8.53 | 301.2 | 3.30 | -195.0 | 417.3 | 1091.7 | 356.6 |
| 11.00 | 307.0 | 2.84 | 753.4 | 449.5 | 356.6 | 809.4 |

Figure 16: mlc km brightness temp. statistics

| | KM1 | KM2 | KM3 | KM4 | KM5 | Uncertain | Cons. Acc. |
|------------|-------|-------|-------|-------|-------|-----------|------------|
| MLC1 | 375 | 0 | 2 | 6 | 9 | 6 | 0.942 |
| MLC2 | 0 | 384 | 13 | 1 | 0 | 2 | 0.960 |
| MLC3 | 6 | 16 | 337 | 23 | 0 | 14 | 0.851 |
| MLC4 | 6 | 104 | 48 | 219 | 0 | 20 | 0.552 |
| MLC5 | 11 | 0 | 0 | 0 | 383 | 3 | 0.965 |
| Prod. Acc. | 0.942 | 0.762 | 0.843 | 0.880 | 0.977 | | |

Figure 17: samples km/mlc km confusion matrix

| λ | μ | σ | Reflectance Covariance ($\times 10^4$) | | | | | | |
|-----------|-------|----------|---|--------|---------|---------|-------|-------|------|
| 0.466 | 0.235 | 0.168 | 282.5 | 334.6 | 210.9 | 235.9 | 318.1 | 201.4 | 7.8 |
| 0.554 | 0.277 | 0.210 | 334.6 | 439.3 | 235.1 | 270.2 | 433.1 | 259.2 | 11.8 |
| 0.646 | 0.244 | 0.137 | 210.9 | 235.1 | 187.2 | 191.6 | 214.0 | 148.8 | 7.0 |
| 0.856 | 0.236 | 0.144 | 235.9 | 270.2 | 191.6 | 206.6 | 249.6 | 165.6 | 6.6 |
| 0.936 | 0.272 | 0.216 | 318.1 | 433.1 | 214.0 | 249.6 | 467.5 | 254.2 | 12.2 |
| 1.242 | 0.157 | 0.127 | 201.4 | 259.2 | 148.8 | 165.6 | 254.2 | 161.3 | 9.1 |
| 1.382 | 0.014 | 0.015 | 7.8 | 11.8 | 7.0 | 6.6 | 12.2 | 9.1 | 2.2 |
| λ | μ | σ | Brightness Temp. Covariance ($\times 10^2$) | | | | | | |
| 3.79 | 304.2 | 10.11 | 10215.1 | 1242.3 | 4219.0 | 5408.5 | | | |
| 7.34 | 254.3 | 4.13 | 1242.3 | 1706.9 | 3105.3 | 3723.4 | | | |
| 8.53 | 286.3 | 11.10 | 4219.0 | 3105.3 | 12328.1 | 13482.3 | | | |
| 11.00 | 288.5 | 12.30 | 5408.5 | 3723.4 | 13482.3 | 15132.9 | | | |

Figure 18: mlc km Uncertain reflectance and brightness temp. statistics