

Ancillary Data

This data set contains the Peter Thomas shape model for Saturn's satellite Helene (Saturn XII), based on optical data from the Cassini Imaging Science Subsystem (ISS) Narrow-Angle Camera (NAC) instrument. The current version of this data set contains the following shape model file:

Helene_30k_plt.tab

This shape model file also has a detached label file, with a suffix of .xml, which describes the format and content. The shape model is in a plate model format and only represents the model shape, with no gravity or slope information.

Coordinate System

+X is Saturn-facing; + Y is opposite the direction of orbital motion; +Z is along the positive rotation axis. Because of orbital eccentricity, the x-axis deviates slightly from perfect Saturn alignment around the orbit; these small deviations are accounted for in the rotation model used.

The rotational model used in construction of this model is a binary kernel:

helene_mst2013.bpc prepared by M. S. Tiscareno, and available through the Navigation and Ancillary Information Facility (NAIF).

For information on using SPICE kernels, please see pck_req.txt - "PCK Required Reading", PCK required reading document, last revised on 2009 Apr 15 by B.V. Semenov.

Confidence Level Notes

Images used and their associated viewing geometries are listed in Table 1 below. Uncertainties in the shape model have been based on pixel scale and spatial density and solution residuals of control points.

Likely uncertainty of model radii for Helene range from 0.15 to 0.3 km, portions of the trailing side are the most uncertain.

Limitations

The shape model is intended for global geometric, geologic, and geophysical studies. The morphology of small craters is not reliably included; some relatively large craters show approximate measures such as depth/diameter. Regional slopes can be calculated to accuracies estimated by the listed uncertainties.

Acknowledgements

The following people helped in the development of the software and/or models during the Cassini mission: Beatrice Mueller and Conor Kingston for direct assistance in formatting and submitting the data sets, Brian Carcich for software development used to derive the shape models, Matt Tiscareno for preparing small body kernels that improved the accuracy of the models, Mike Evans for assistance in modifying the plate model format to meet PDS Requirements, Chuck Acton for assistance in archiving kernels, Pam Smith for data management.

Table 1. Cassini ISS Images used for Helene shape model

Filter: filters used in each filter wheel. CL: clear; UV: ultraviolet; VIO: violet; BL: blue; GRN: green; MT: methane; RED: red; CB: methane continuum; IR: infrared; P: polarization. Details of filter bandpasses and use in Porco et al. (2004).

SC lat lon: Sub spacecraft position in degrees. Lon is West longitude where 90°W is the leading point.

Solar lat lon: sub solar position in degrees

Range: distance to object center from spacecraft, km

Noraz: image orientation of the projected object spin axis, degrees clockwise from up.

Samp: object center x-coordinate in image 0 is at left of image in pixels

Line: object center y-coordinate in image; 0 is at top of image in pixels

Phase: solar phase angle at center of image in degrees.

Images used in construction of model of HELENE:

| Image | filt | filt | S/C | | Solar | | range | noraz | samp | line | phase |
|---------------|------|------|-------|--------|--------|--------|---------|--------|---------|---------|--------|
| | | | lat | lon | lat | lon | | | | | |
| N1519536732_1 | CL1 | CL2 | -0.41 | 95.93 | -18.36 | 193.82 | 67839.7 | 359.77 | 606.60 | 522.50 | 97.36 |
| N1519536772_1 | CL1 | UV3 | -0.41 | 95.76 | -18.35 | 193.88 | 67864.2 | 359.77 | 606.60 | 522.80 | 97.57 |
| N1519537004_1 | RED | CL2 | -0.39 | 94.74 | -18.36 | 194.24 | 68033.3 | 359.77 | 602.80 | 523.90 | 98.89 |
| N1519537272_1 | CL1 | CL2 | -0.36 | 93.58 | -18.36 | 194.65 | 68273.0 | 359.77 | 591.60 | 525.70 | 100.38 |
| N1534480072_1 | CL1 | CL2 | 73.69 | 31.79 | -16.07 | 245.12 | 50353.1 | 142.54 | 396.40 | 348.70 | 119.42 |
| N1534481076_1 | CL1 | CL2 | 78.94 | 59.89 | -16.08 | 246.64 | 52753.8 | 172.61 | 388.30 | 625.30 | 117.06 |
| N1534481274_1 | P0 | UV3 | 79.50 | 67.37 | -16.07 | 246.94 | 53324.1 | 180.37 | 390.80 | 621.40 | 116.57 |
| N1534481348_1 | P120 | UV3 | 79.67 | 70.38 | -16.07 | 247.05 | 53551.3 | 183.48 | 392.00 | 623.60 | 116.38 |
| N1534483492_1 | CL1 | GRN | 75.28 | 138.75 | -16.07 | 250.33 | 61948.0 | 253.04 | 351.70 | 605.80 | 110.95 |
| N1563643679_1 | CL1 | CL2 | -2.59 | 316.77 | -11.26 | 21.05 | 38892.2 | 349.66 | 548.90 | 376.90 | 64.28 |
| N1563643701_1 | CL1 | UV3 | -2.59 | 316.94 | -11.26 | 21.08 | 38874.6 | 349.66 | 549.00 | 376.80 | 64.14 |
| N1563643795_1 | P0 | UV3 | -2.60 | 317.69 | -11.27 | 21.22 | 38801.5 | 349.66 | 548.20 | 373.70 | 63.54 |
| N1563644304_1 | P0 | GRN | -2.65 | 321.96 | -11.27 | 22.00 | 38478.2 | 349.66 | 532.40 | 550.70 | 60.11 |
| N1563644326_1 | P60 | GRN | -2.65 | 322.14 | -11.27 | 22.03 | 38467.6 | 349.66 | 529.20 | 551.50 | 59.97 |
| N1606207298_1 | CL1 | CL2 | 25.83 | 348.02 | -3.89 | 337.66 | 69065.2 | 289.49 | 910.10 | 825.50 | 31.37 |
| N1606207328_1 | CL1 | UV3 | 25.54 | 347.91 | -3.89 | 337.70 | 68934.5 | 289.49 | 912.80 | 828.60 | 31.05 |
| N1606208668_1 | CL1 | GRN | 10.70 | 343.24 | -3.89 | 339.74 | 65609.4 | 289.54 | 1010.20 | 862.90 | 15.00 |
| N1606208687_1 | CL1 | IR3 | 10.48 | 343.18 | -3.89 | 339.77 | 65605.1 | 289.53 | 1011.20 | 866.90 | 14.77 |
| N1646314891_1 | CL1 | CL2 | -3.20 | 2.45 | 3.04 | 199.30 | 23842.0 | 355.82 | 830.70 | 584.50 | 163.17 |
| N1646315051_1 | CL1 | CL2 | -3.41 | 2.90 | 3.04 | 199.55 | 22394.2 | 355.81 | 862.60 | 581.40 | 163.37 |
| N1646315160_1 | CL1 | CL2 | -3.57 | 3.22 | 3.04 | 199.71 | 21388.8 | 355.80 | 886.00 | 580.90 | 163.53 |
| N1646315201_1 | CL1 | CL2 | -3.63 | 3.35 | 3.04 | 199.77 | 21027.2 | 355.80 | 829.00 | 587.80 | 163.60 |
| N1646315298_1 | CL1 | CL2 | -3.78 | 3.67 | 3.04 | 199.92 | 20145.0 | 355.78 | 908.40 | 579.10 | 163.76 |
| N1646315747_1 | CL1 | CL2 | -4.75 | 5.31 | 3.04 | 200.60 | 16052.5 | 355.71 | 904.30 | 585.60 | 164.65 |
| N1646318554_1 | CL1 | GRN | -7.68 | 177.05 | 3.04 | 204.87 | 9827.9 | 224.72 | 1054.50 | 1074.70 | 29.75 |
| N1646318609_1 | CL1 | IR1 | -7.31 | 177.52 | 3.04 | 204.96 | 10320.8 | 224.67 | 1035.20 | 1050.20 | 29.27 |
| N1646318664_1 | CL1 | IR3 | -6.97 | 177.94 | 3.04 | 205.04 | 10810.7 | 224.62 | 1015.20 | 1030.50 | 28.84 |
| N1646318719_1 | BL1 | CL2 | -6.66 | 178.34 | 3.04 | 205.12 | 11306.5 | 224.58 | 996.40 | 1009.30 | 28.44 |
| N1646318774_1 | RED | CL2 | -6.38 | 178.72 | 3.04 | 205.21 | 11803.8 | 224.55 | 982.00 | 989.30 | 28.08 |
| N1646318829_1 | IR2 | CL2 | -6.12 | 179.06 | 3.04 | 205.29 | 12297.9 | 224.52 | 962.20 | 972.60 | 27.75 |
| N1646318891_1 | IR4 | CL2 | -5.86 | 179.42 | 3.04 | 205.38 | 12842.1 | 224.49 | 943.90 | 956.90 | 27.41 |
| N1646319003_1 | UV2 | CL2 | -5.43 | 180.03 | 3.04 | 205.55 | 13850.2 | 224.44 | 915.50 | 930.90 | 26.86 |
| N1646319036_1 | CL1 | CL2 | -5.30 | 180.21 | 3.05 | 205.61 | 14169.1 | 224.43 | 907.30 | 922.30 | 26.71 |
| N1646319098_1 | P0 | UV3 | -5.10 | 180.50 | 3.05 | 205.70 | 14713.2 | 224.41 | 895.50 | 908.30 | 26.46 |
| N1646319138_1 | P60 | UV3 | -4.98 | 180.69 | 3.04 | 205.76 | 15075.4 | 224.40 | 885.00 | 900.80 | 26.30 |
| N1646319218_1 | P0 | MT2 | -4.75 | 181.04 | 3.04 | 205.88 | 15796.6 | 224.38 | 873.80 | 886.20 | 26.01 |
| N1646319330_1 | P60 | MT2 | -4.46 | 181.50 | 3.04 | 206.05 | 16812.3 | 224.35 | 852.30 | 868.10 | 25.65 |
| N1646319442_1 | P120 | MT2 | -4.20 | 181.93 | 3.04 | 206.22 | 17829.0 | 224.34 | 836.90 | 854.40 | 25.33 |
| N1646319549_1 | CL1 | CL2 | -3.98 | 182.32 | 3.04 | 206.38 | 18821.5 | 224.32 | 817.60 | 840.50 | 25.05 |
| N1646319727_1 | BL1 | GRN | -3.66 | 182.91 | 3.04 | 206.66 | 20423.7 | 224.30 | 796.20 | 820.10 | 24.66 |
| N1646319894_1 | HAL | CL2 | -3.40 | 183.42 | 3.04 | 206.91 | 21952.8 | 224.28 | 779.70 | 804.00 | 24.34 |
| N1646320156_1 | CL1 | UV3 | -3.06 | 184.16 | 3.05 | 207.31 | 24342.7 | 224.26 | 755.70 | 781.00 | 23.93 |
| N1646320371_1 | CL1 | IR3 | -2.83 | 184.70 | 3.04 | 207.64 | 26308.2 | 224.24 | 739.10 | 767.10 | 23.67 |
| N1646320608_1 | CL1 | CL2 | -2.61 | 185.30 | 3.06 | 207.99 | 28480.2 | 224.39 | 725.80 | 752.10 | 23.38 |
| N1675163339_1 | CL1 | CL2 | -4.27 | 86.81 | 7.84 | 174.04 | 27742.9 | 232.30 | 591.40 | 655.60 | 87.85 |
| N1675163412_1 | CL1 | UV3 | -4.27 | 88.03 | 7.84 | 174.15 | 27785.2 | 231.83 | 590.80 | 673.10 | 86.75 |
| N1675163467_1 | CL1 | GRN | -4.27 | 88.98 | 7.85 | 174.23 | 27825.2 | 231.45 | 590.20 | 671.60 | 85.89 |
| N1675163533_1 | CL1 | IR3 | -4.26 | 90.09 | 7.84 | 174.34 | 27880.0 | 231.00 | 587.80 | 672.70 | 84.90 |
| N1675164723_1 | P0 | UV3 | -3.95 | 108.90 | 7.84 | 176.14 | 30249.0 | 178.28 | 606.00 | 584.50 | 68.10 |
| N1675164801_1 | P60 | UV3 | -3.92 | 110.01 | 7.84 | 176.26 | 30484.3 | 178.21 | 602.70 | 584.90 | 67.12 |
| N1675164879_1 | P120 | UV3 | -3.89 | 111.12 | 7.84 | 176.37 | 30733.3 | 178.14 | 603.90 | 587.30 | 66.14 |

| | | | | | | | | | | | |
|---------------|-----|-----|-------|--------|------|--------|---------|--------|--------|--------|--------|
| N1675164967_1 | P60 | GRN | -3.86 | 112.46 | 7.84 | 176.52 | 31048.7 | 178.06 | 598.00 | 584.60 | 64.96 |
| N1675165000_1 | P12 | GRN | -3.84 | 112.91 | 7.85 | 176.56 | 31161.3 | 178.03 | 599.70 | 586.80 | 64.56 |
| N1675165188_1 | P12 | MT2 | -3.77 | 115.42 | 7.84 | 176.85 | 31818.8 | 177.89 | 595.10 | 588.20 | 62.37 |
| N1687117945_1 | CL1 | UV3 | 2.69 | 176.14 | 9.75 | 25.30 | 10495.7 | 179.87 | 576.90 | 585.60 | 148.40 |
| N1687118095_1 | CL1 | IR1 | 2.76 | 173.63 | 9.75 | 25.54 | 9964.2 | 179.86 | 579.30 | 589.20 | 145.84 |
| N1687118267_1 | CL1 | GRN | 2.83 | 170.48 | 9.75 | 25.80 | 9408.2 | 179.85 | 576.20 | 589.90 | 142.64 |
| N1687118327_1 | CL1 | IR1 | 2.85 | 169.29 | 9.75 | 25.89 | 9222.6 | 179.84 | 572.30 | 590.50 | 141.43 |
| N1687118439_1 | CL1 | CL2 | 2.88 | 166.89 | 9.76 | 26.06 | 8890.7 | 179.84 | 567.20 | 592.20 | 138.99 |
| N1687118671_1 | CL1 | CL2 | 2.96 | 161.40 | 9.76 | 26.42 | 8262.4 | 179.82 | 557.20 | 595.60 | 133.39 |
| N1687118701_1 | RED | CL2 | 2.98 | 160.62 | 9.75 | 26.46 | 8188.3 | 179.81 | 557.80 | 595.40 | 132.60 |
| N1687118731_1 | CL1 | GRN | 2.99 | 159.83 | 9.75 | 26.51 | 8115.9 | 179.81 | 553.00 | 596.00 | 131.79 |
| N1687118963_1 | CL1 | GRN | 3.01 | 153.20 | 9.75 | 26.86 | 7618.9 | 179.79 | 539.70 | 596.80 | 125.05 |
| N1687119023_1 | CL1 | IR1 | 3.03 | 151.34 | 9.75 | 26.95 | 7510.1 | 179.78 | 537.50 | 596.10 | 123.16 |
| N1687119060_1 | CL1 | IR3 | 3.01 | 150.20 | 9.76 | 27.00 | 7449.4 | 179.78 | 536.00 | 598.90 | 122.00 |
| N1687119105_1 | CL1 | UV3 | 3.01 | 148.80 | 9.75 | 27.07 | 7380.3 | 179.77 | 533.00 | 598.30 | 120.58 |
| N1687119135_1 | CL1 | CL2 | 3.02 | 147.73 | 9.75 | 27.12 | 7331.3 | 179.77 | 530.30 | 598.90 | 119.49 |
| N1687119255_1 | CL1 | IR1 | 3.00 | 143.68 | 9.75 | 27.30 | 7177.1 | 179.76 | 524.00 | 599.10 | 115.37 |
| N1687119539_1 | CL1 | UV3 | 2.88 | 133.62 | 9.76 | 27.74 | 6978.3 | 179.74 | 519.70 | 601.00 | 105.12 |
| N1687119599_1 | RED | CL2 | 2.84 | 131.34 | 9.75 | 27.83 | 6966.8 | 179.73 | 519.10 | 601.60 | 102.80 |
| N1687119719_1 | CL1 | IR3 | 2.75 | 126.98 | 9.75 | 28.01 | 6978.2 | 179.72 | 516.10 | 604.50 | 98.36 |
| N1687119756_1 | CL1 | UV3 | 2.72 | 125.67 | 9.75 | 28.06 | 6990.1 | 179.72 | 513.50 | 603.00 | 97.03 |
| N1687119816_1 | RED | CL2 | 2.66 | 123.42 | 9.76 | 28.16 | 7020.1 | 179.72 | 516.40 | 602.00 | 94.73 |
| N1687119906_1 | CL1 | IR1 | 2.57 | 120.21 | 9.76 | 28.30 | 7084.2 | 179.72 | 512.00 | 602.60 | 91.44 |
| N1687119936_1 | CL1 | IR3 | 2.54 | 119.18 | 9.75 | 28.34 | 7110.1 | 179.71 | 512.60 | 604.80 | 90.40 |
| N1687119973_1 | CL1 | UV3 | 2.50 | 117.93 | 9.75 | 28.39 | 7145.1 | 179.71 | 511.90 | 602.20 | 89.12 |
| N1687120033_1 | RED | CL2 | 2.43 | 115.79 | 9.76 | 28.49 | 7214.9 | 179.71 | 512.70 | 602.80 | 86.93 |
| N1687120123_1 | CL1 | IR1 | 2.33 | 112.78 | 9.76 | 28.63 | 7334.7 | 179.71 | 510.40 | 600.40 | 83.84 |
| N1687120153_1 | CL1 | IR3 | 2.28 | 111.82 | 9.76 | 28.67 | 7378.8 | 179.71 | 511.50 | 604.40 | 82.87 |
| N1687120190_1 | CL1 | UV3 | 2.24 | 110.66 | 9.75 | 28.72 | 7435.5 | 179.70 | 510.30 | 602.80 | 81.68 |
| N1687120370_1 | CL1 | IR3 | 2.02 | 105.13 | 9.75 | 29.00 | 7768.8 | 179.70 | 511.80 | 604.20 | 75.99 |
| N1687120407_1 | CL1 | UV3 | 1.98 | 104.09 | 9.75 | 29.05 | 7844.0 | 179.70 | 510.10 | 602.30 | 74.92 |
| N1687120497_1 | CL1 | GRN | 1.89 | 101.55 | 9.76 | 29.20 | 8047.6 | 179.70 | 509.70 | 602.40 | 72.29 |
| N1687120557_1 | CL1 | IR1 | 1.82 | 99.96 | 9.75 | 29.29 | 8190.5 | 179.70 | 511.20 | 600.80 | 70.64 |
| N1687120587_1 | CL1 | IR3 | 1.78 | 99.20 | 9.75 | 29.33 | 8262.9 | 179.70 | 510.80 | 603.40 | 69.86 |
| N1687120624_1 | CL1 | UV3 | 1.74 | 98.29 | 9.75 | 29.38 | 8353.4 | 179.70 | 511.30 | 601.60 | 68.92 |
| N1687120684_1 | RED | CL2 | 1.67 | 96.78 | 9.75 | 29.48 | 8514.7 | 179.70 | 513.60 | 600.80 | 67.35 |
| N1687120774_1 | CL1 | IR1 | 1.57 | 94.69 | 9.75 | 29.62 | 8761.0 | 179.70 | 512.00 | 601.40 | 65.17 |
| N1687120804_1 | CL1 | IR3 | 1.52 | 94.03 | 9.75 | 29.66 | 8844.9 | 179.70 | 512.40 | 603.00 | 64.49 |
| N1687120841_1 | CL1 | UV3 | 1.48 | 93.25 | 9.75 | 29.72 | 8948.1 | 179.70 | 513.20 | 600.60 | 63.67 |
| N1687121104_1 | CL1 | CL2 | 1.24 | 88.04 | 9.76 | 30.12 | 9763.5 | 179.71 | 489.60 | 654.90 | 58.20 |
| N1687121164_1 | CL1 | CL2 | 1.18 | 87.00 | 9.76 | 30.22 | 9960.1 | 179.71 | 489.70 | 593.60 | 57.09 |
| N1687121224_1 | CL1 | CL2 | 1.13 | 85.99 | 9.76 | 30.30 | 10160.4 | 179.71 | 489.00 | 533.90 | 56.03 |
| N1687121284_1 | CL1 | CL2 | 1.07 | 85.03 | 9.75 | 30.39 | 10364.3 | 179.71 | 490.60 | 473.30 | 55.01 |
| N1687121464_1 | CL1 | CL2 | 0.93 | 82.39 | 9.76 | 30.67 | 10995.3 | 179.72 | 496.30 | 292.90 | 52.18 |
| N1687121524_1 | CL1 | CL2 | 0.88 | 81.58 | 9.75 | 30.76 | 11211.4 | 179.71 | 498.30 | 232.10 | 51.31 |