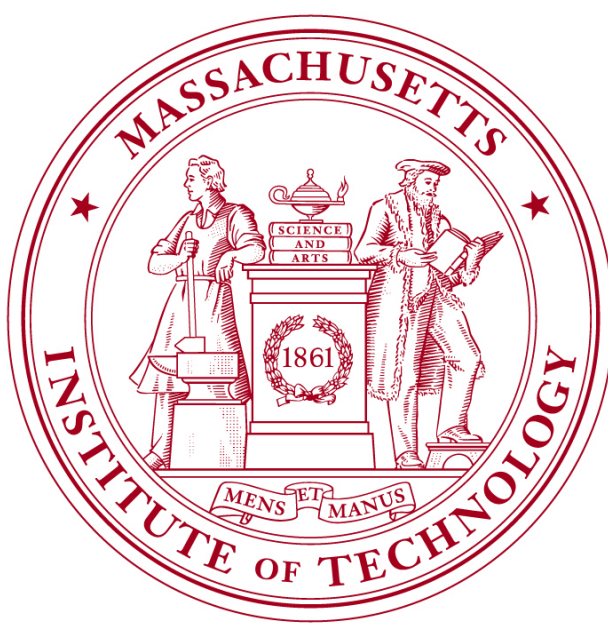
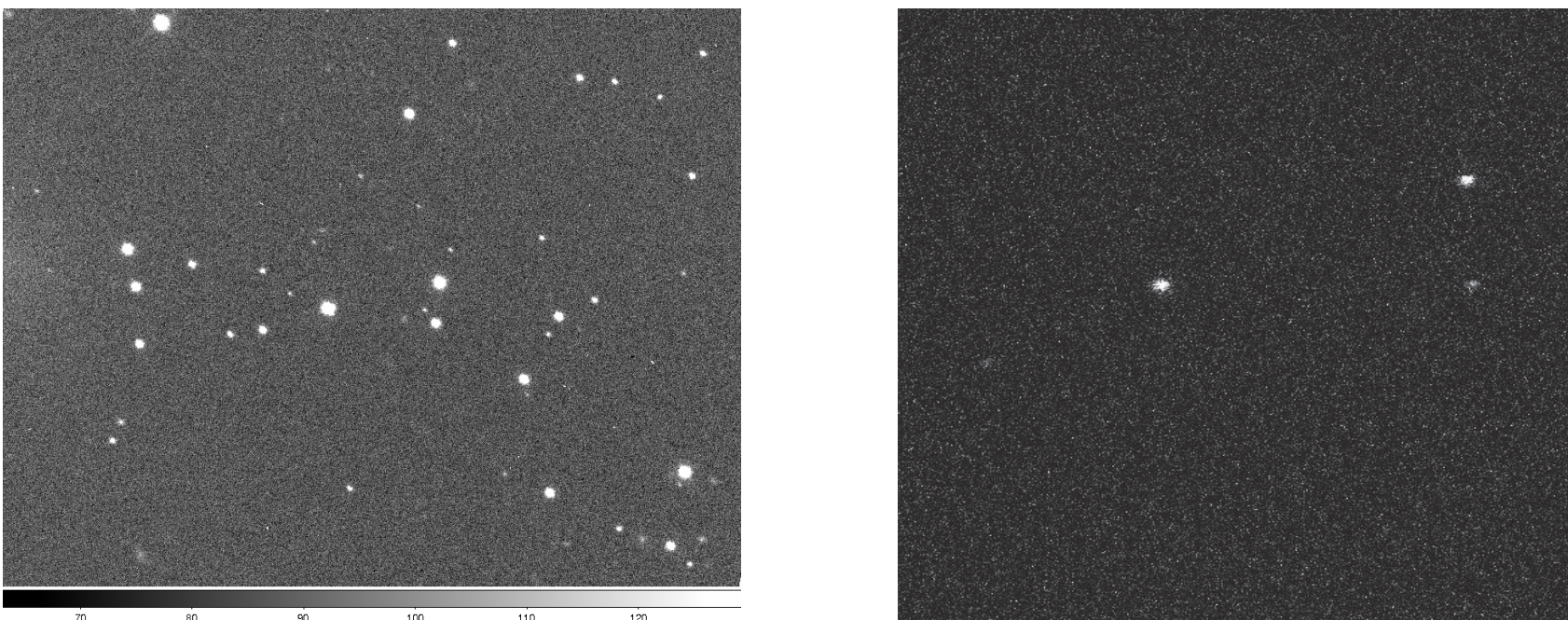


(224.11) Attempted Stellar-Occultation Observations for KBO (20000) Varuna



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Faulkes North (Haleakala) images from Federica Bianco (UCSB/LCOGT). North is up and East is on the left. (left) 5'x5' field. (right) <2'x2' field.

Finding chart for KBO (20000) Varuna for the event

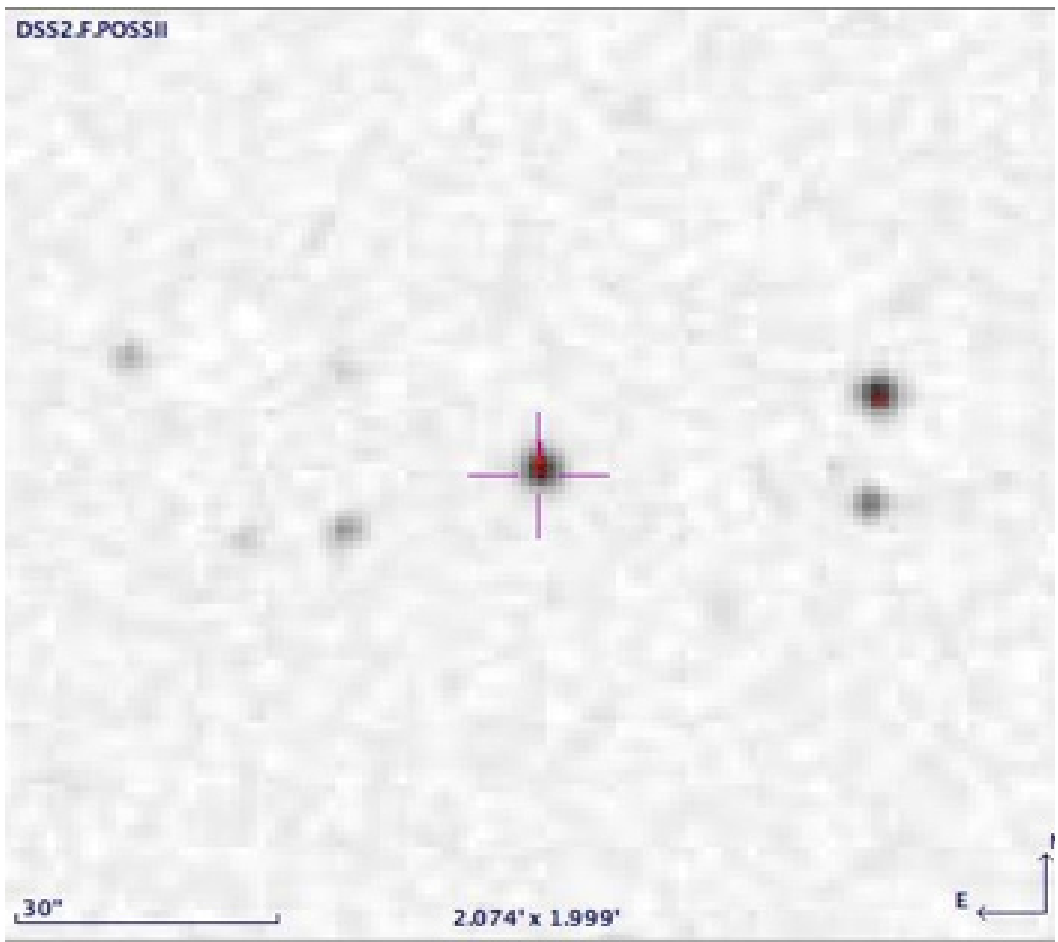
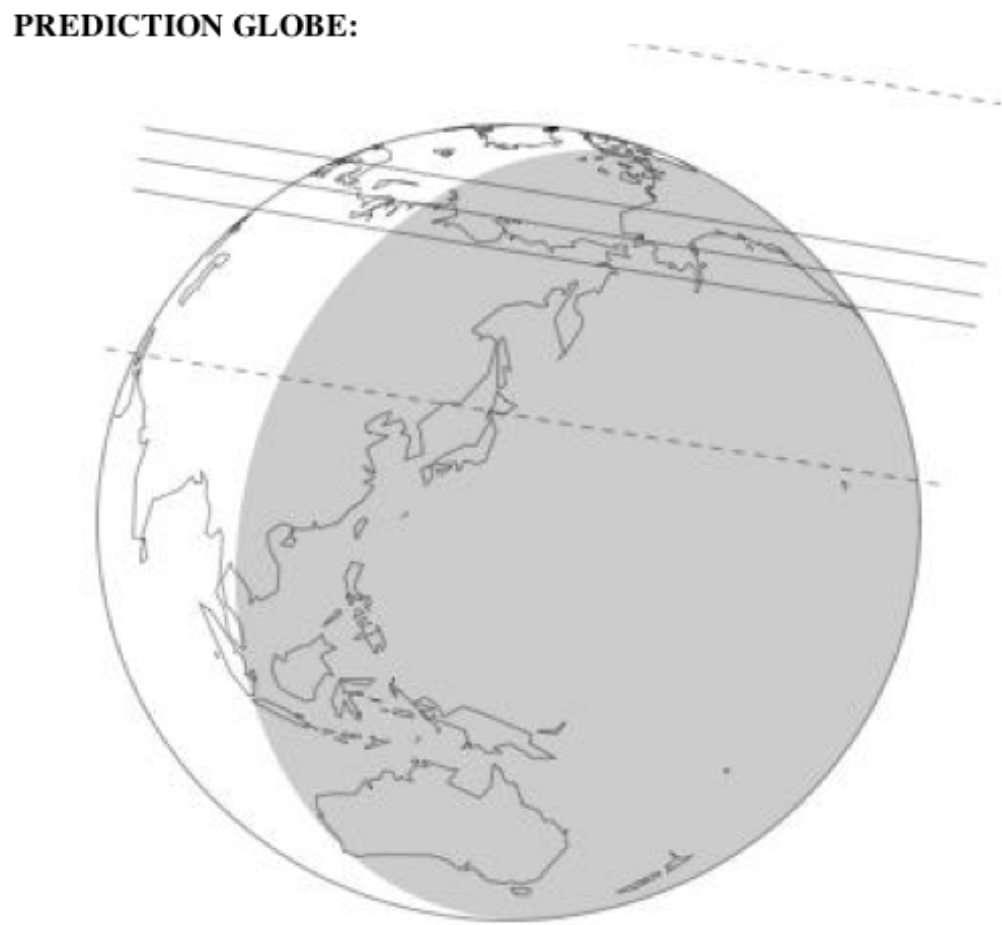


Image from VizierR (<http://vizier.u-strasbg.fr/viz-bin/VizieR>)

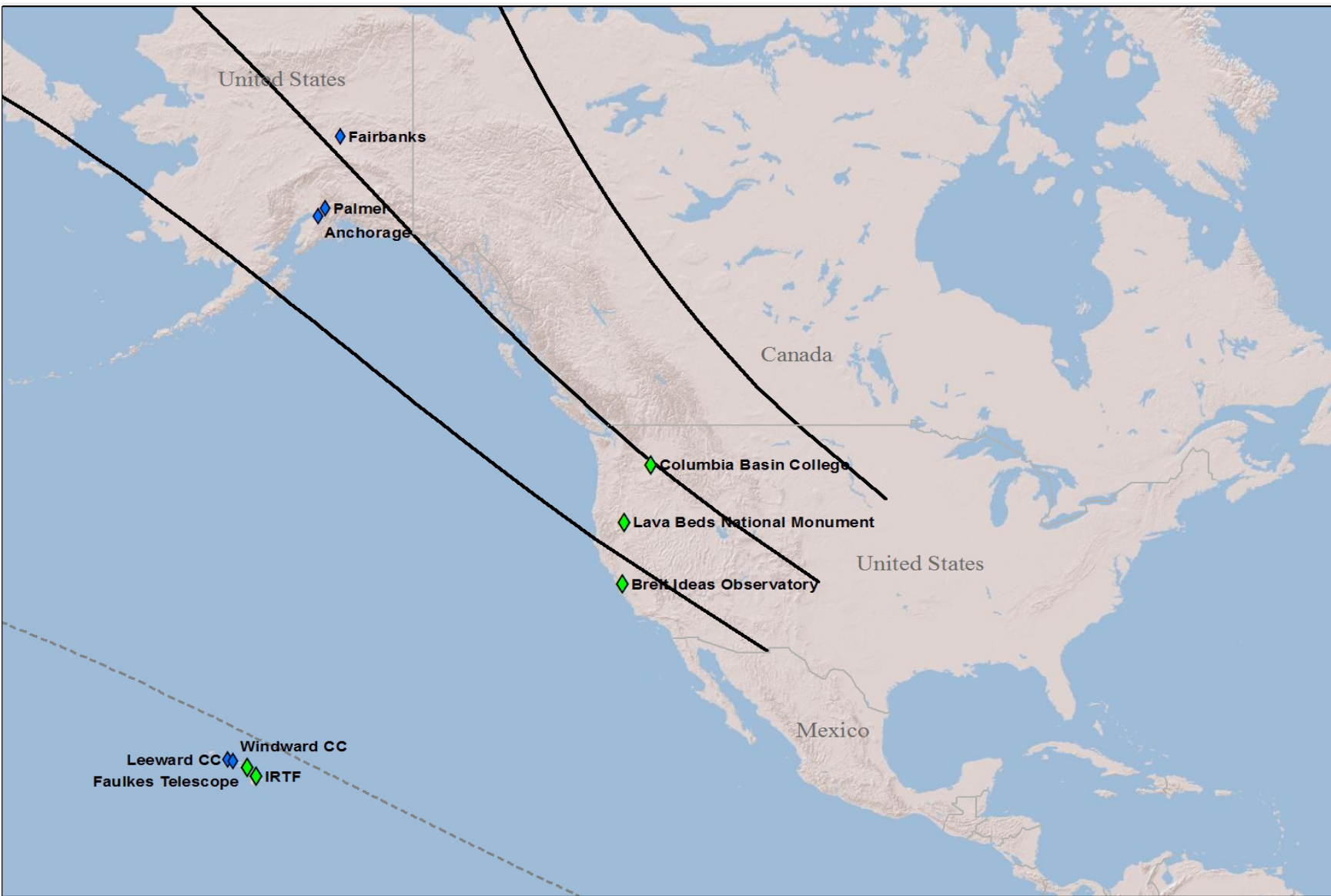
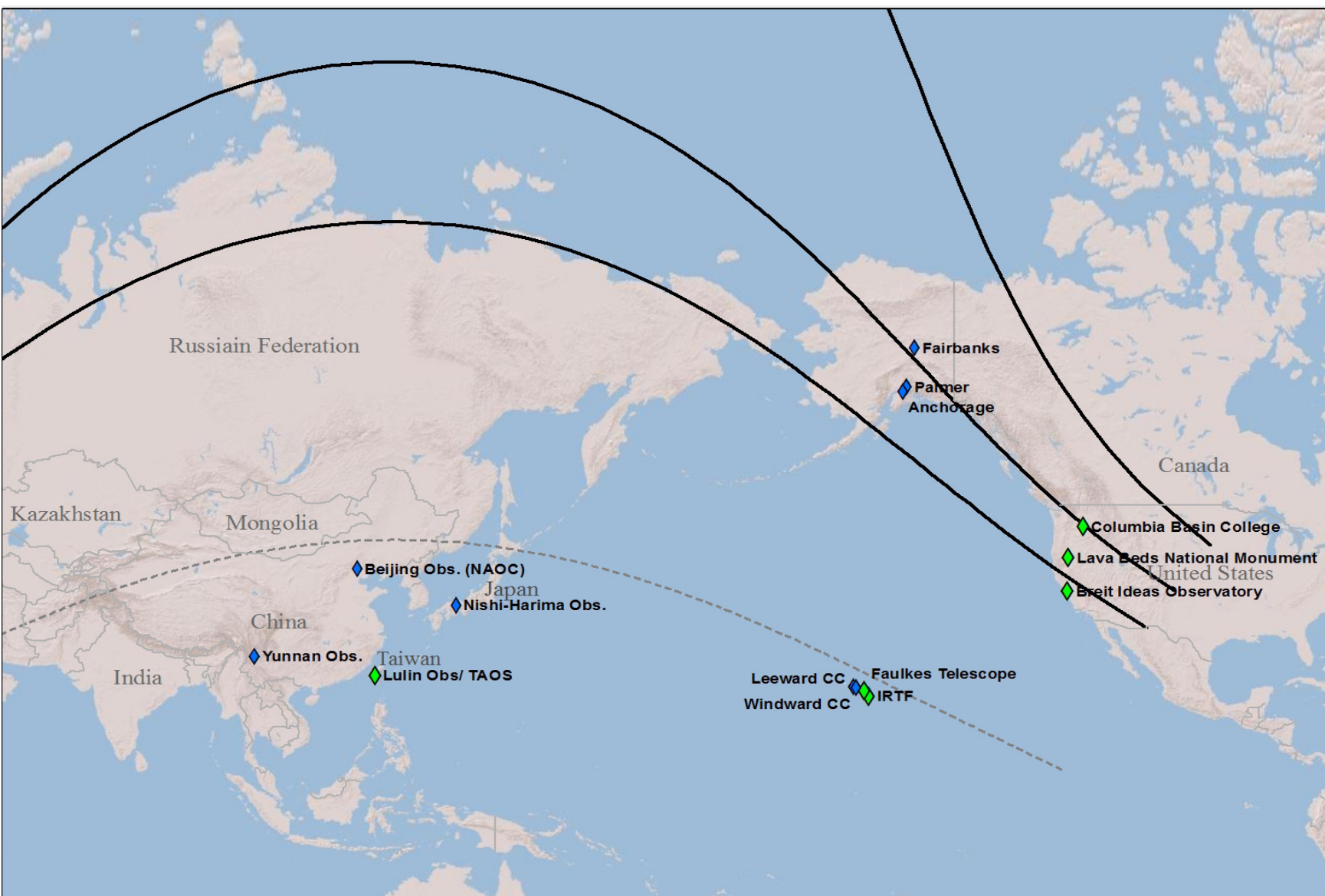
A FITS image from the Faulkes North (Haleakala) sequence at close to the predicted time for mid-occultation. The occultation star was UCAC2=15.5 (BVR 15.340, 15.100, 15.220) with Varuna’s V magnitude 20.2. Comparison stars used for the light curve were US-NO-B1 1162-0142653 (B2~15.93, R2~15.41) and USNO-B1 1162-0142656 (B2~17.24, R2~16.88). In the small FOV (~1.3x1.3 arcmin), one other star is visible but extremely faint (USNO-B1 1162-0142680, B2~18.04, R2~17.15).



This map and the color maps on the right show the predicted path of Varuna’s shadow. The three solid lines correpsond to the northern limit, centerline, southern limit. The dotted lines show the 3 sigma uncertainty in our prediction.

ABSTRACT
We attempted to observe the 10 February 2011 occultation of a star of UCAC2 magnitude 15.5 by the Kuiper-belt object (20000) Varuna (visual magnitude 20.2), to determine its size, albedo, and other basic properties. Our original predictions showed the path going between Hawaii and Alaska, but SMARTS astrometry a month before the event moved the prediction 1,646 km north, so we added sites in the northwestern continental US and Alaska. We had clear weather at several sites in the predicted path (Alaska, Pacific Northwest), another site in the 1-sigma path (California), and several sites near the 3-sigma path (Hawaii, China, Taiwan), though no occultation was detected. Clouds or other problems prevented observations at several other sites. The appulse observations will be used to improve the ephemeris for future Varuna observations.

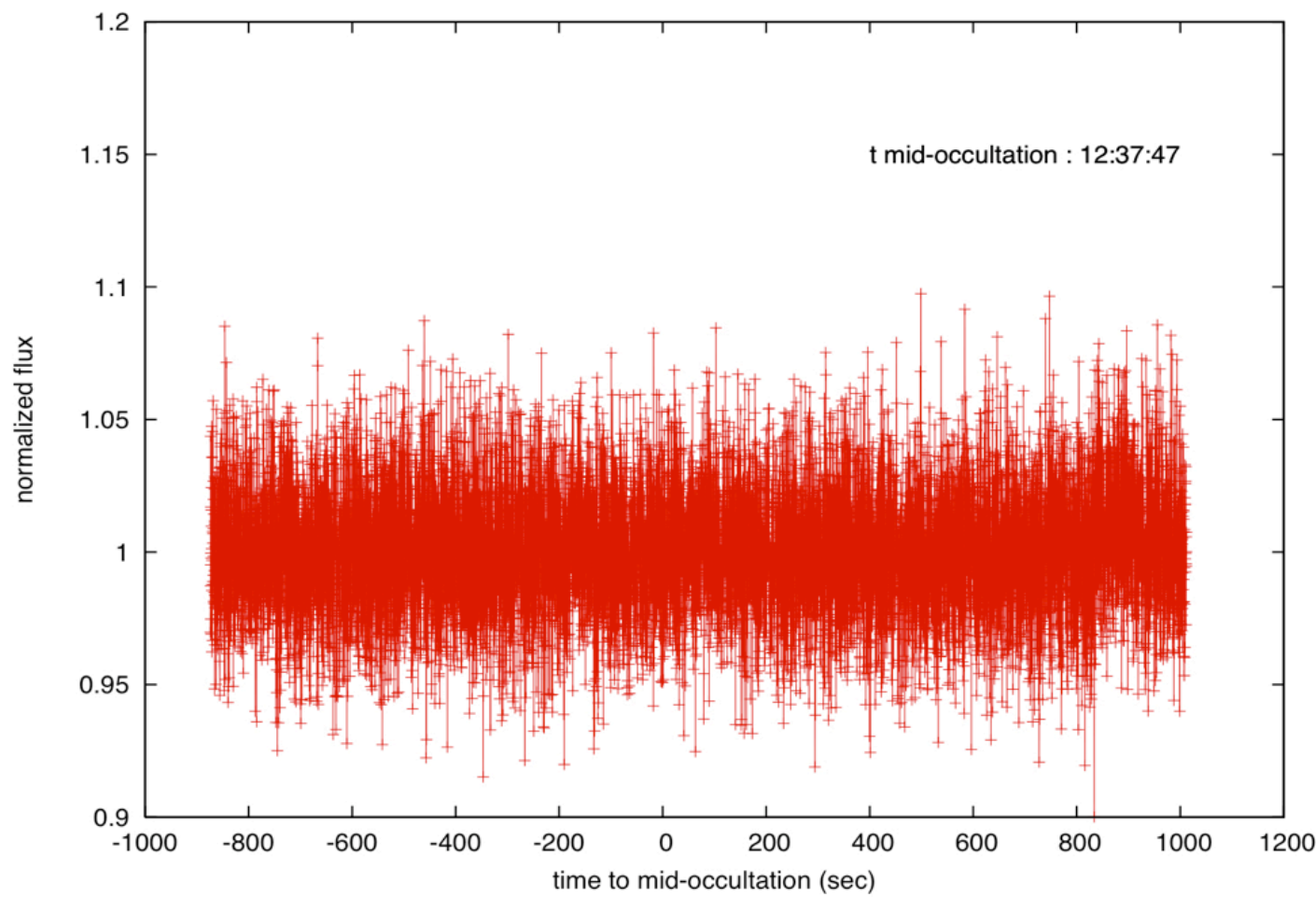
See <http://occult.mit.edu/research/occultations/kbo/Varuna/Varuna.20110210/index.html> and <http://stellaroccultations.info>.



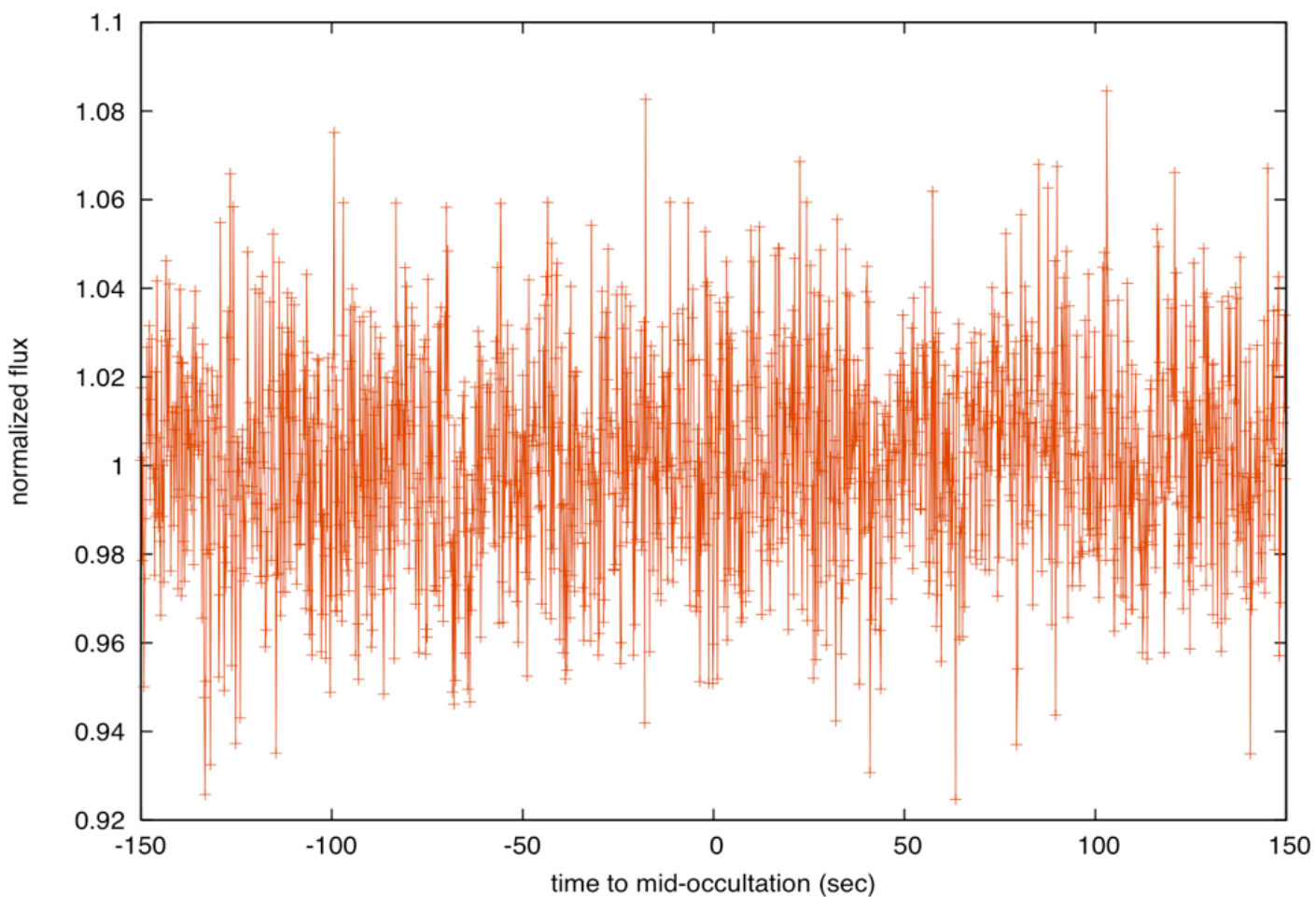
Observing sites for this occultation are indicated in the maps above. Blue indicates sites unable to observe because of bad weather and green indicates sites with negative results. Site details are listed in the table below.

Location	Telescope Size (m)	Observer(s)	C/A (km)	Status & Notes
Fairbanks, Alaska	0.35	Matthew Lockhart	64 N.	Unable to observe due to weather
Columbia Basin College, WA	0.4	Tony George	5 S.	Observed. Reported not seeing an occultation.
Palmer, Alaska	0.65	Amanda Zangari & Jim Egger	119 S.	Unable to observe due to weather
Anchorage, Alaska	0.4	Katherine Lonerган & Steven Menaker	158 S.	Unable to observe due to weather
Lava Beds National Monument, CA	0.3	Steve Preston	324 S.	Observed. Reported not seeing an occultation.
Breit Ideas, CA	0.3	Derek Breit	635 S.	Observed. Reported not seeing an occultation.
Haleakala; Hawaii (Faulkes)	2.0	Federica Bianco	3517 S.	Observed. Reported not seeing an occultation.
Windward Community College; Hawaii	0.4	J. Pasachoff & J. Ciotti & M. Kessler	3524 S.	Observed through intermittent clouds.
Leeward Community College; Hawaii	0.5	Bryce Babcock & Kakkala Mohanan	3534 S.	Unable to observe due to weather
IRTF; Hawaii	3.0	Michael Person & Amanda Gulbis	3564 S.	Observed. Did not see an occultation.
Beijing Astronomical Observatory	1.0	Xiaojuan Jiang	3611 S.	Unable to observe due to weather
Nishi-Harima Astronomical Obs (Hyogo, Japan)	2.0	Noritaka Tokimasa	4162 S.	Unable to observe due to weather
Yunnan	2.4	Jinming Bai	4923 S.	Unable to observe due to weather
Lulin Observatory (Taiwan)	0.5, 1.0	Matt Lehner & Wen-Ping Chen	5484 S.	Observed. Reported not seeing an occultation. TAOS. Unable to record due to tech problems.

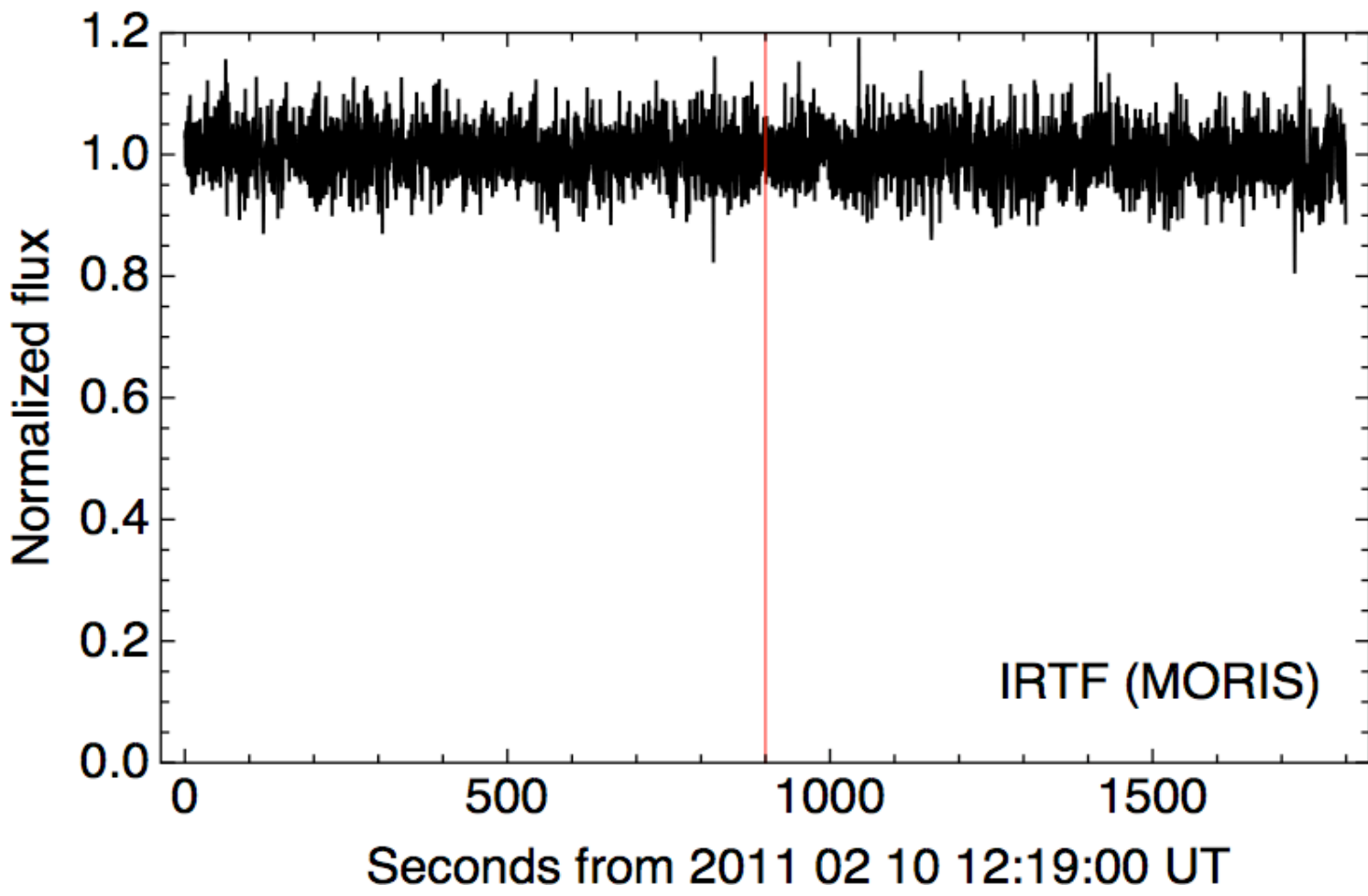
Light curves



Light curve with aperture photometry (pyraf iraf.phot package) from the Faulkes North (Haleakala) Telescope (2 m, Maui) with an Andor Luca R at 5 Hz (0.2 sec exposure, frame-transfer mode) in electron-multiplying mode (gain 200), clear filter. Mid-occultation calculation gives 02/10/2011 12:37:47 UT. (From Federica Bianco, UCSB-Las Cumbres Observatory Global Telescope Network)



Faulkes North (Haleakala) light curve of a higher time resolution shows no significant decrease in the intensity of the light from the occulting star.



A light curve from the IRTF. The comparison star used to derive the light curve was USNO-B 1162-01-0142653, the brighter of the two nearby stars. We took data remotely at 2 Hz with no filter using MORIS (an Andor iXon camera) in conventional mode. The red line on the plot represents the predicted midtime. Observers: Michael Person and Amanda Gulbis. (See Gulbis, A. A. S., S. J. Bus, J. L. Elliot, J. T. Rayner, W. E. Stahlberger, F. E. Rojas, E. R. Adams, M. J. Person, R. Chung, A. T. Tokunaga, and C. A. Zuluaga, 2011, “First results from the MIT Optical Rapid Imaging System (MORIS) on the IRTF: a stellar occultation by Pluto and a transit by exoplanet XO-2b,” Publ. Astron. Soc. Pacific, 123, 461-469.)

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