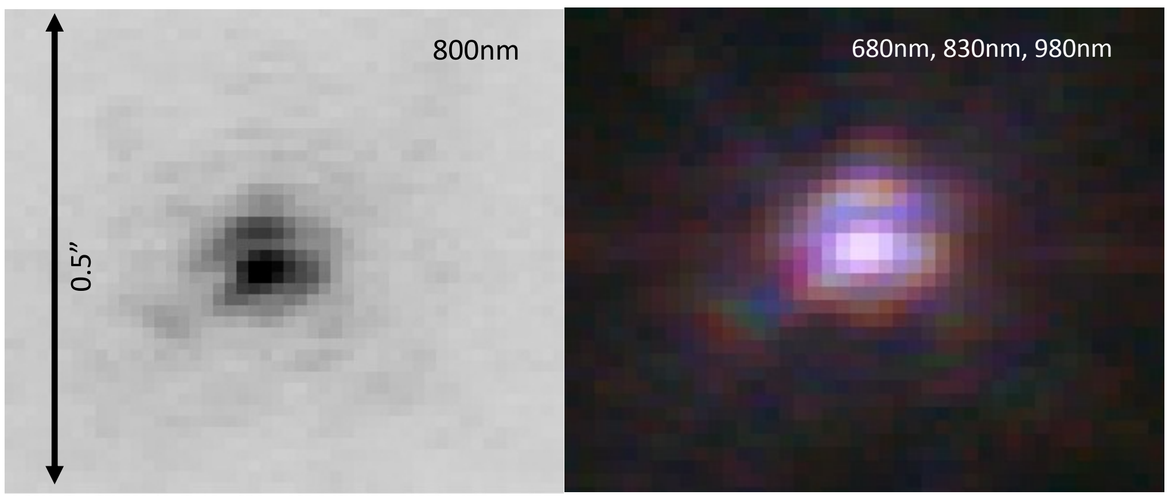
Diffraction-limited observations with SWIFT and P3K

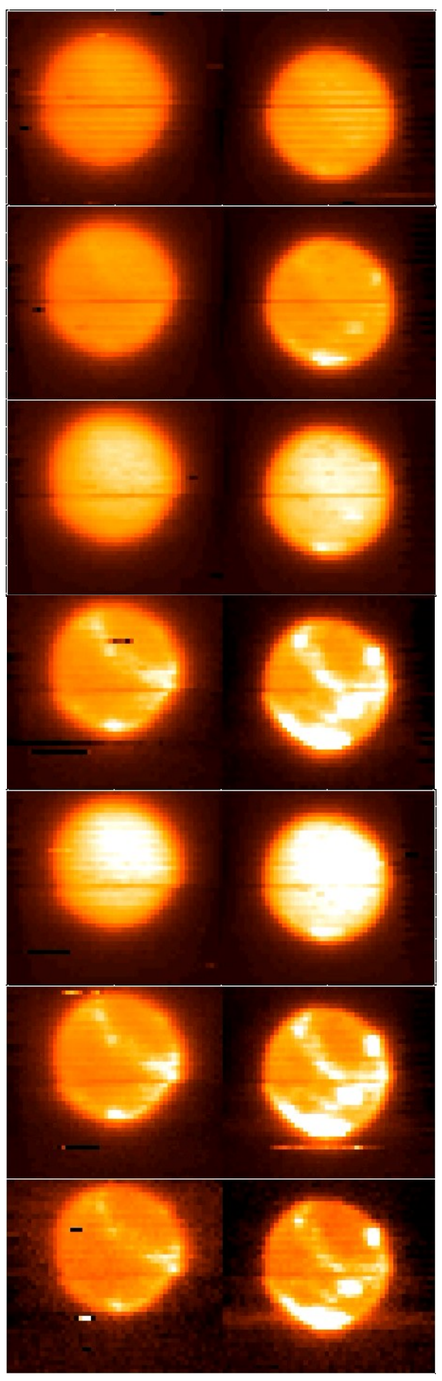
Fraser Clarke, Matthias Tecza, Niranjan Thatte, Ryan Houghton, Kieran O'Brien, Leigh Fletcher, Pat Irwin

Overview

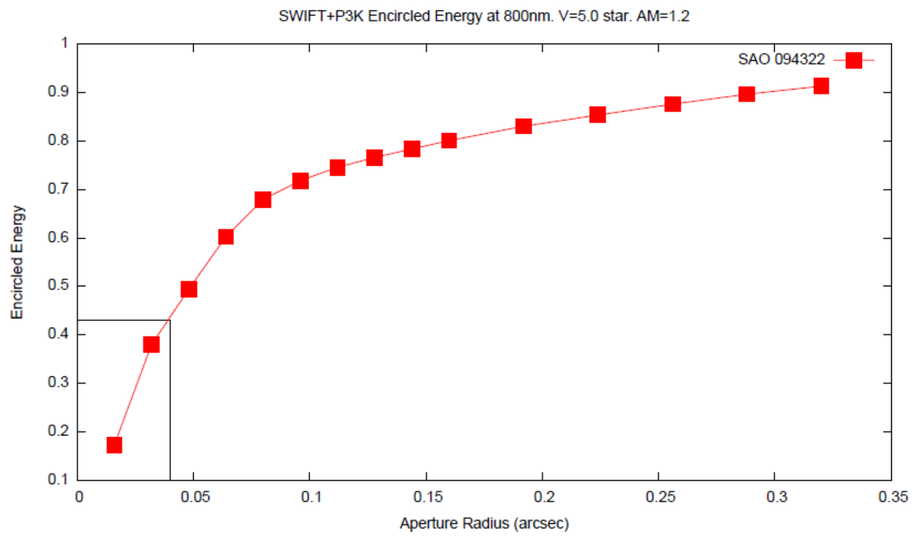
In July and October 2012, we had two successful runs with SWIFT and the P3K AO system in good seeing. On both occasions, with due care to AO performance, we achieved diffraction limited performance in the visible regime covered by SWIFT. We present here some initial results from both the 80mas and 16mas spaxel scales, concentrating on the solar-system targets.



On-sky AO corrected PSF showing a diffraction limited core and first airy ring (not complete). Right hand image combines the PSF at three wavelengths to show wavelength scaling of diffraction features (speckles). Both images with log-scaling to show low level features (16mas scale)

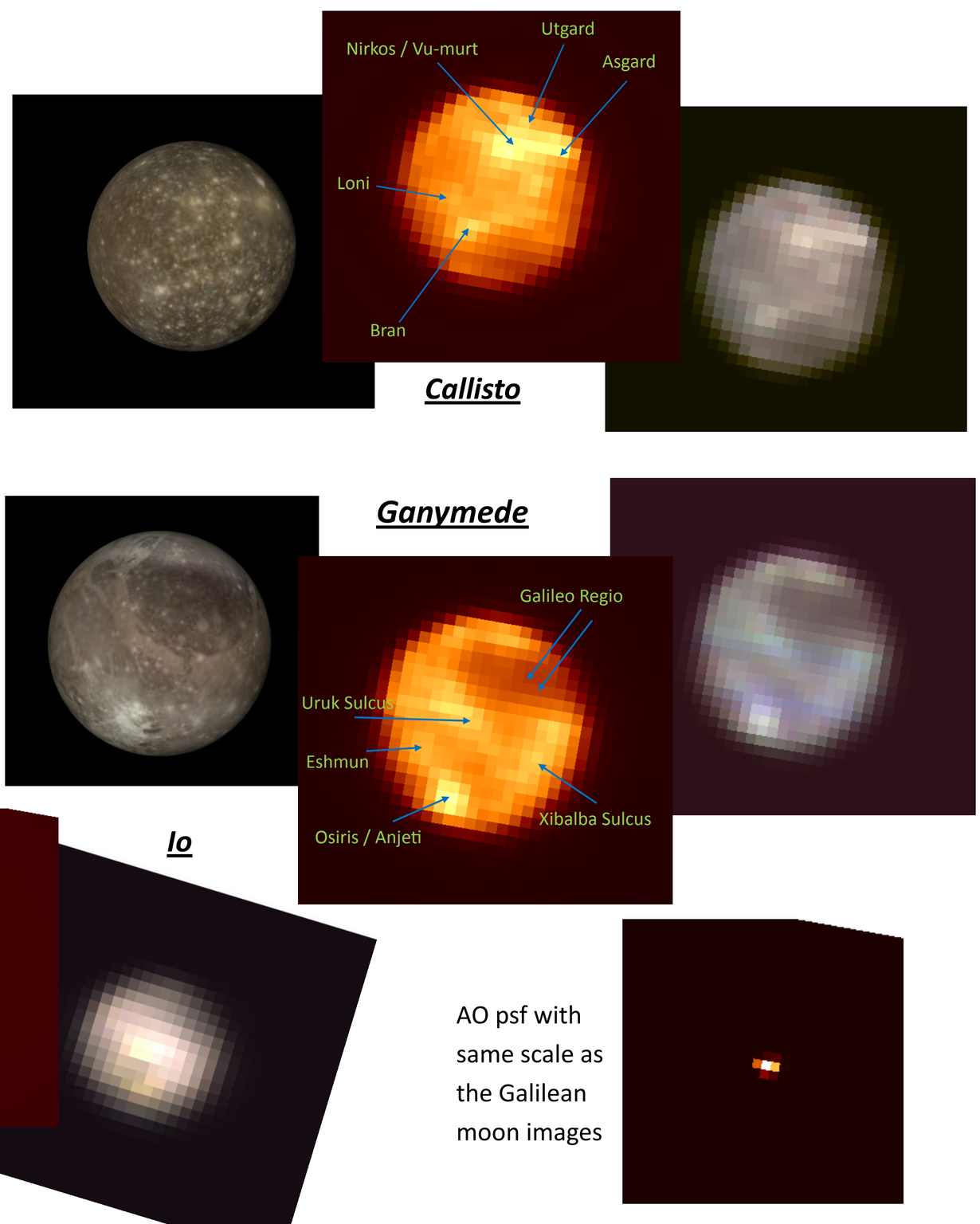


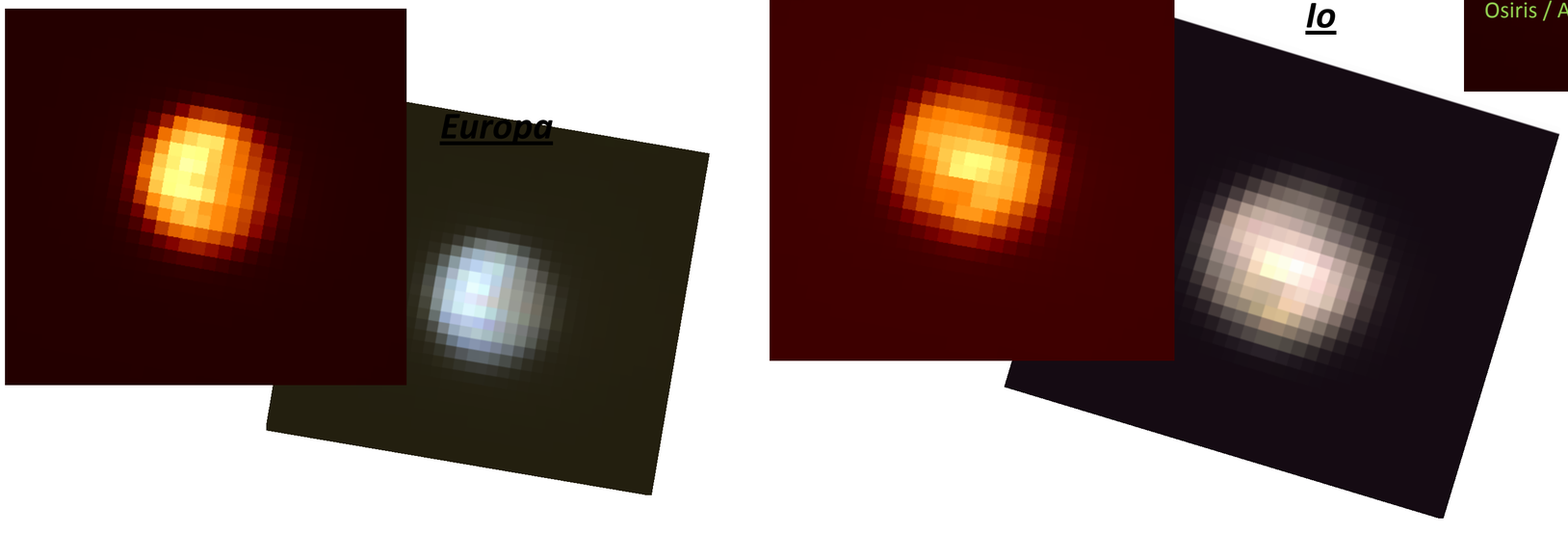
Evolution of clouds on Neptune. Data taken over three hours showing the evolution of high clouds in Neptune as the planet rotates. AO correction on Neptune itself. Quick data reduction only (80mas scale)



Measure of encircled energy at 800nm on a V=5.0 star at AM=1.2. About 40% of the total flux is contained within the central core of the PSF.

Surfaces of the Galilean moons at 250km/pixel resolution. Each panel shows a model based on Galileo in-orbit imaging compared to SWIFT+P3K observations. Major surface features on Callisto and Ganymede are easily identified. A quick 3-colour image of each moon has been made from the IFU data. More detailed analysis of the 1Å/pixel spectral data will allow us to search for narrow ice features varying across the surface. This is substantially higher spectral resolution data than obtained by in-orbit missions. The PSF of a star is also shown to the same scale as the images of the moons. At this over-sampled scale (80mas/pixel), each pixel is effectively independent. All objects were also observed at 16mas/pixel, but the data reduction (in particular mosaicking the <1” field of view!) is not yet complete.





AO psf with same scale as the Galilean moon images