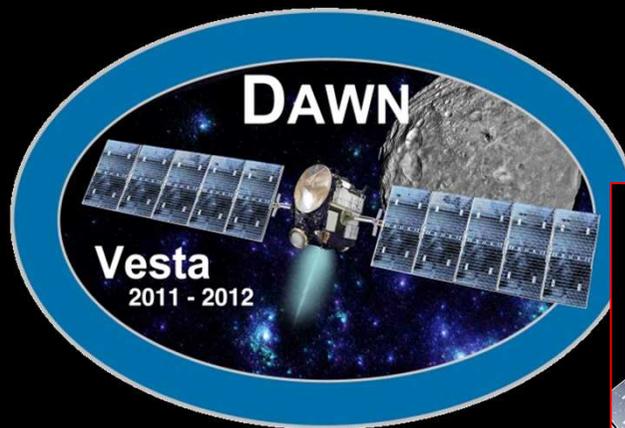




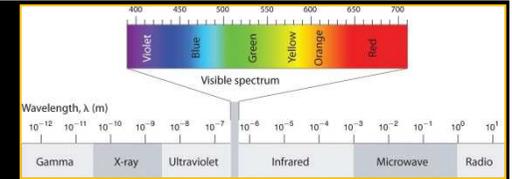
VISUAL INFRARED SPECTROMETERS THE ITALIAN SEARCH FOR THE ORIGIN OF THE SOLAR SYSTEM



Mario Salatti

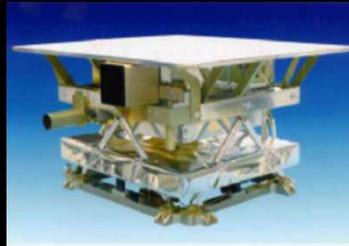
Unit «Exploration and Observation of the Universe»
Agenzia Spaziale Italiana (ASI)

VIS-NIR Spectrometers



VIMS-V Cassini
 Visual and Infrared
 Mapping Spectrometer (VIS Channel)
 Spectral range: 300-1050 nm (96 bands)

1997



VIRTIS-M Rosetta
 Visible and Infrared Thermal
 Imaging Spectrometer (Mapping Channel)
 Spectral range VIS 250-1050 nm, IR 1000-5000 nm (432 bands each)

2004



VIRTIS-M Mars Express
 Visible and Infrared Thermal
 Imaging Spectrometer (Mapping Channel)
 Spectral range VIS 250-1050 nm, IR 1000-5000 nm (432 bands each)

2005

Reached end of life

2007

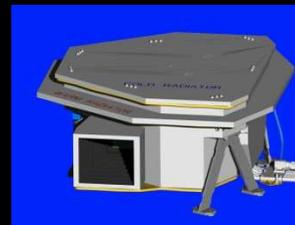
VIR-MS Dawn
 Visible and Infrared
 Mapping Spectrometer



Standalone realization of VIRTIS-M without -H channel

2011

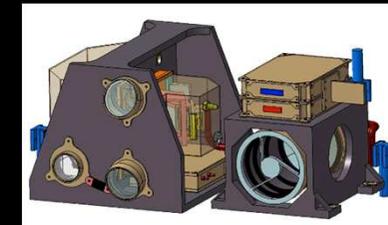
JIRAM Juno
 JIRAM Jovian InfraRed
 Auroral Mapper



Spectral range: : 2000-5000 nm (432 bands)

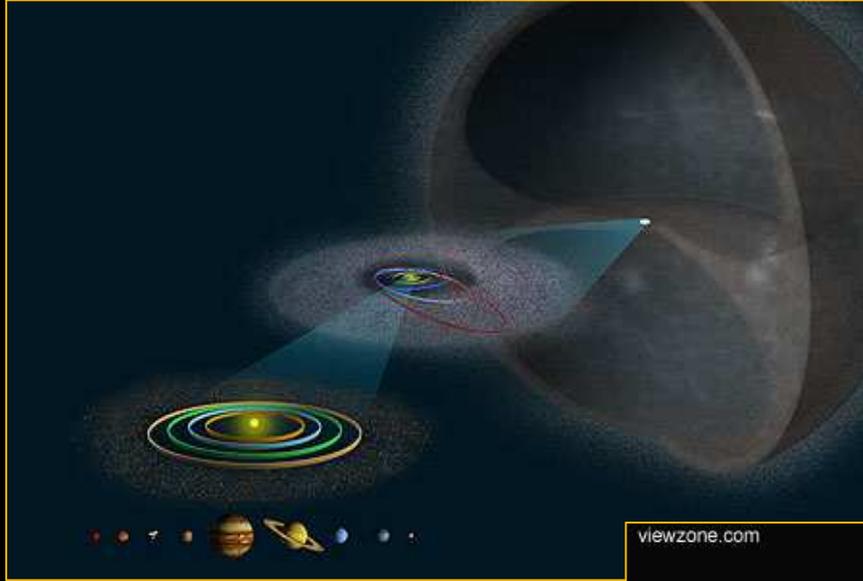
2013

SIMBIO-SYS/VIHI BepiColombo
 Visible Infrared Hyperspectral Imager



Spectral range 400-2200 nm (256 bands)

Unveil the secrets?



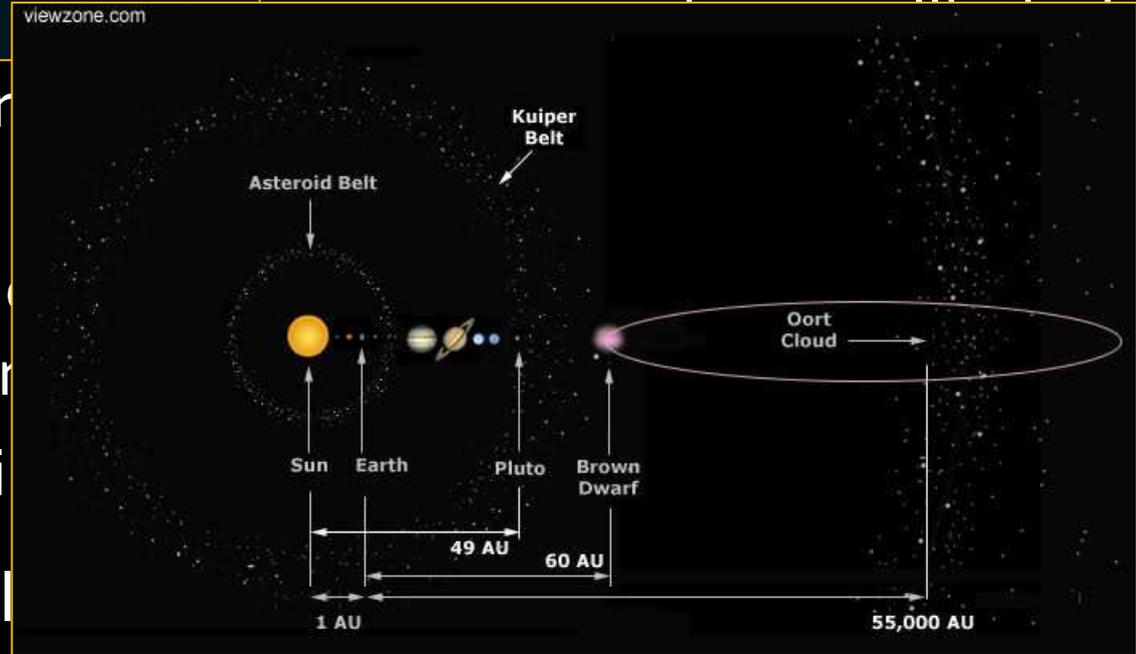
...are minor bodies of the
 ...formed by geological processes,
 ...story of the building blocks
 ...protoplanetary disk 4.6 Byrs ago
 ...of chemical compounds that

...orbits; they originate in the
 ...Kuiper Belt

- Asteroids are located in the Asteroid Belt

Both were responsible for the delivery of water to Earth

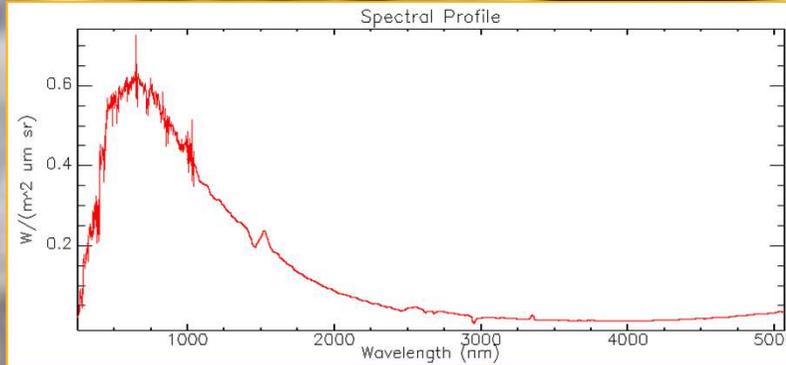
- ...and maybe life



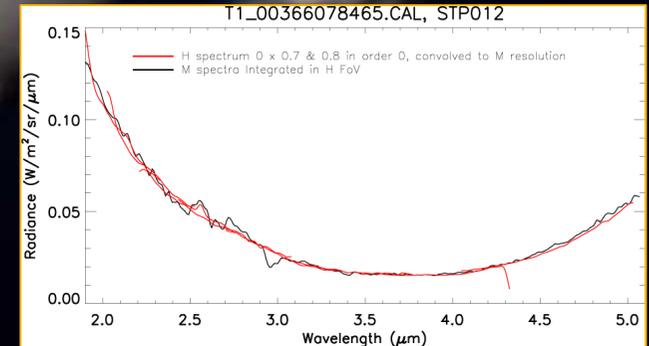
Asteroids and Comets for Rosetta...



Italian Space Agency



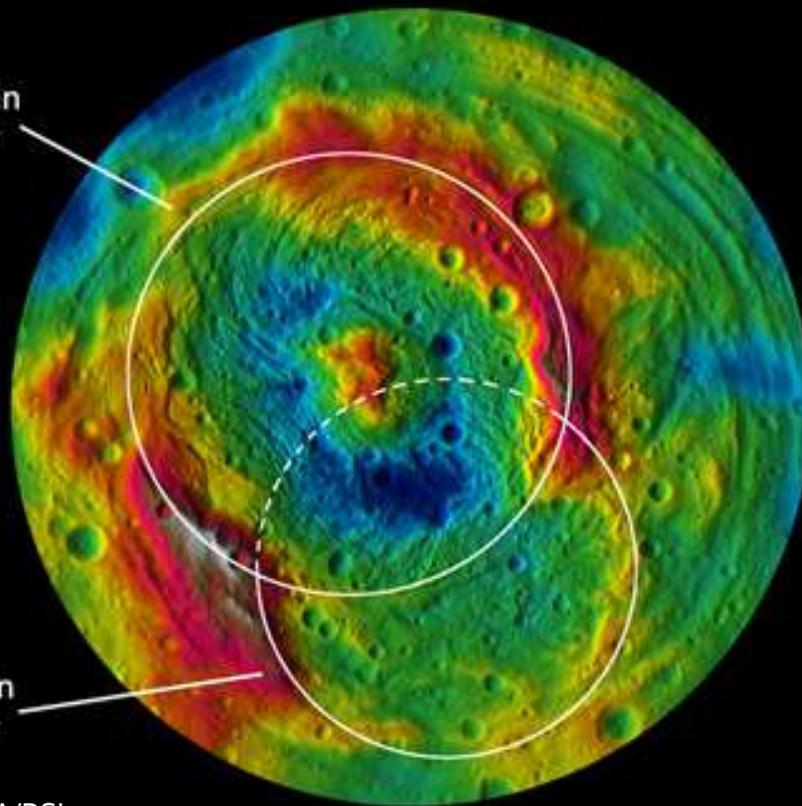
52nd STSC, 5 February 2015



...Main Belt Asteroids for Da

Rheasilvia Basin
500 km diameter

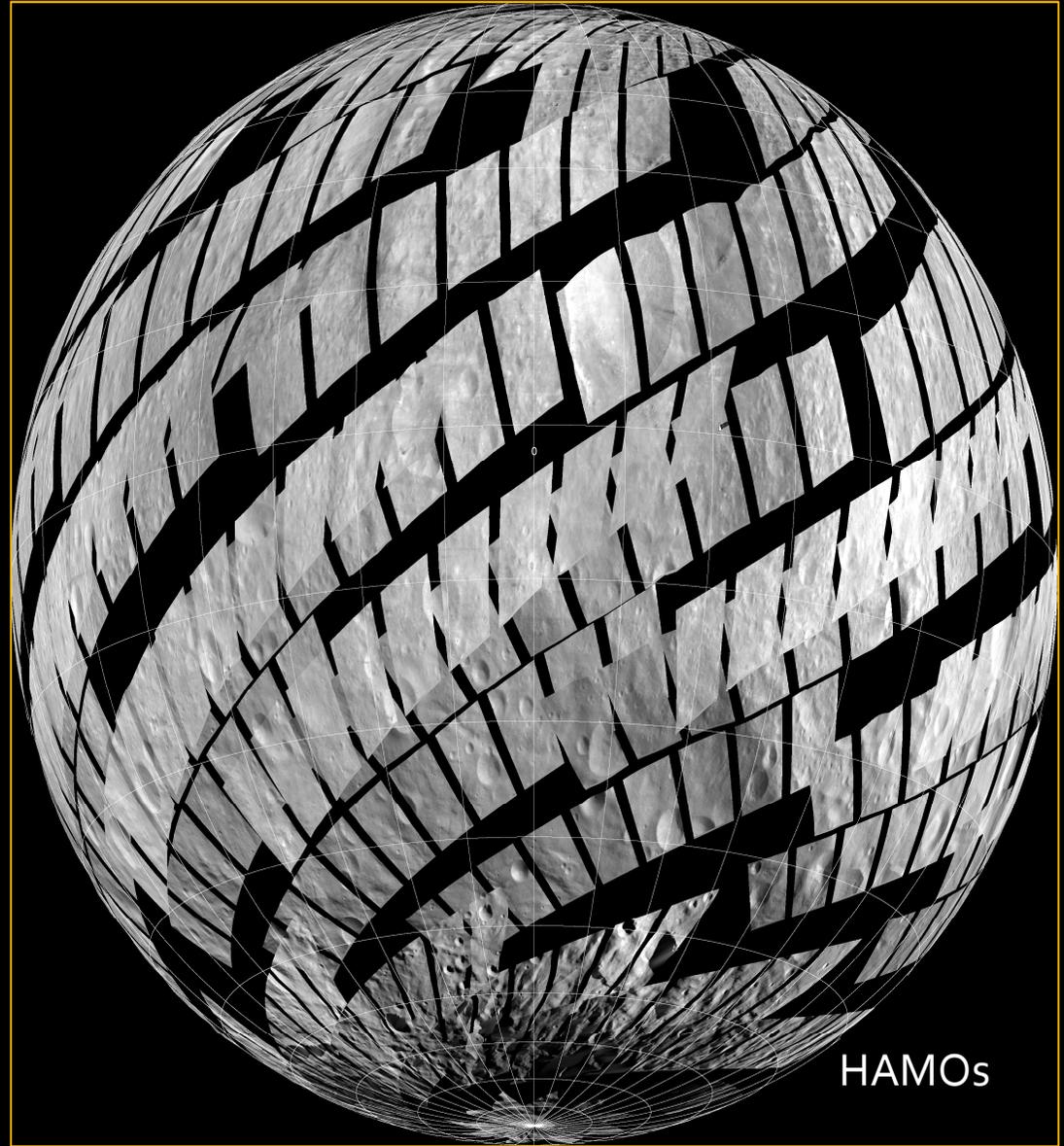
Veneneia Basin
400 km diameter



NASA/JPL-Caltech/UCLA/MPS/DLR/IDA/PSI

VIR Global Coverage on Vesta

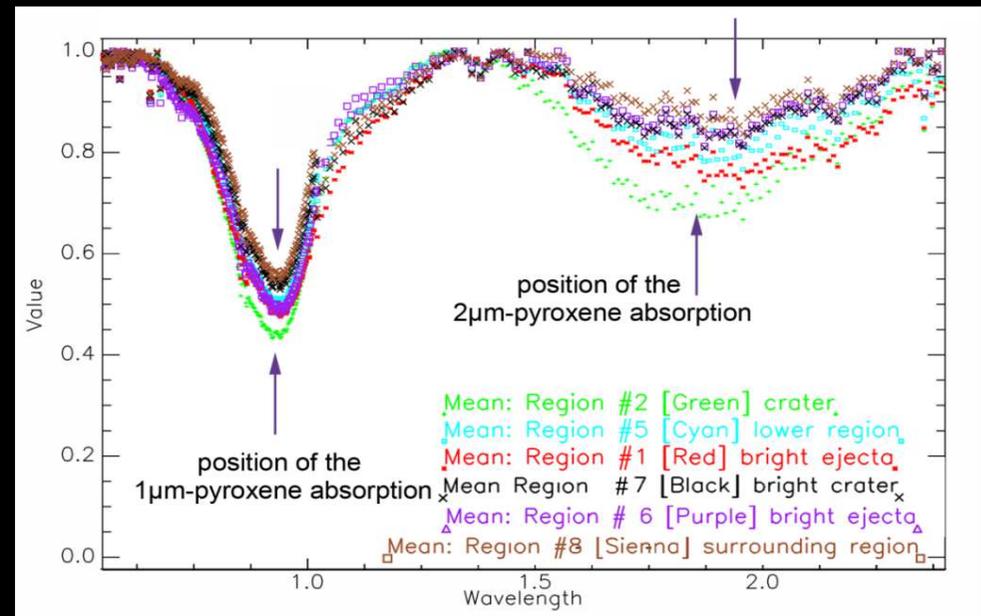
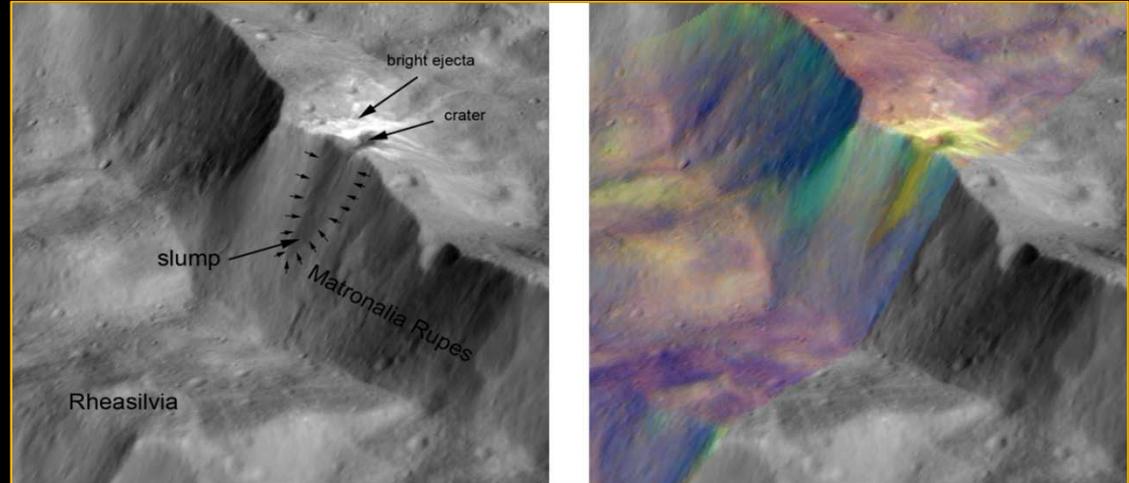
- The VIR nominal pixel resolution, during these phases, ranges from 1300 m to 70 m
- VIR covered about 90% of Vesta surface
- Data of high quality, from 0.2 to 5 microns, have been acquired in 864 spectral channels



Vesta Mineralogy

□ Spectral Diversity at Local Scale

Vesta surface shows considerable local diversity at hundred-meters scale in terms of spectral reflectance and emission, band centers, depths and spectral slopes



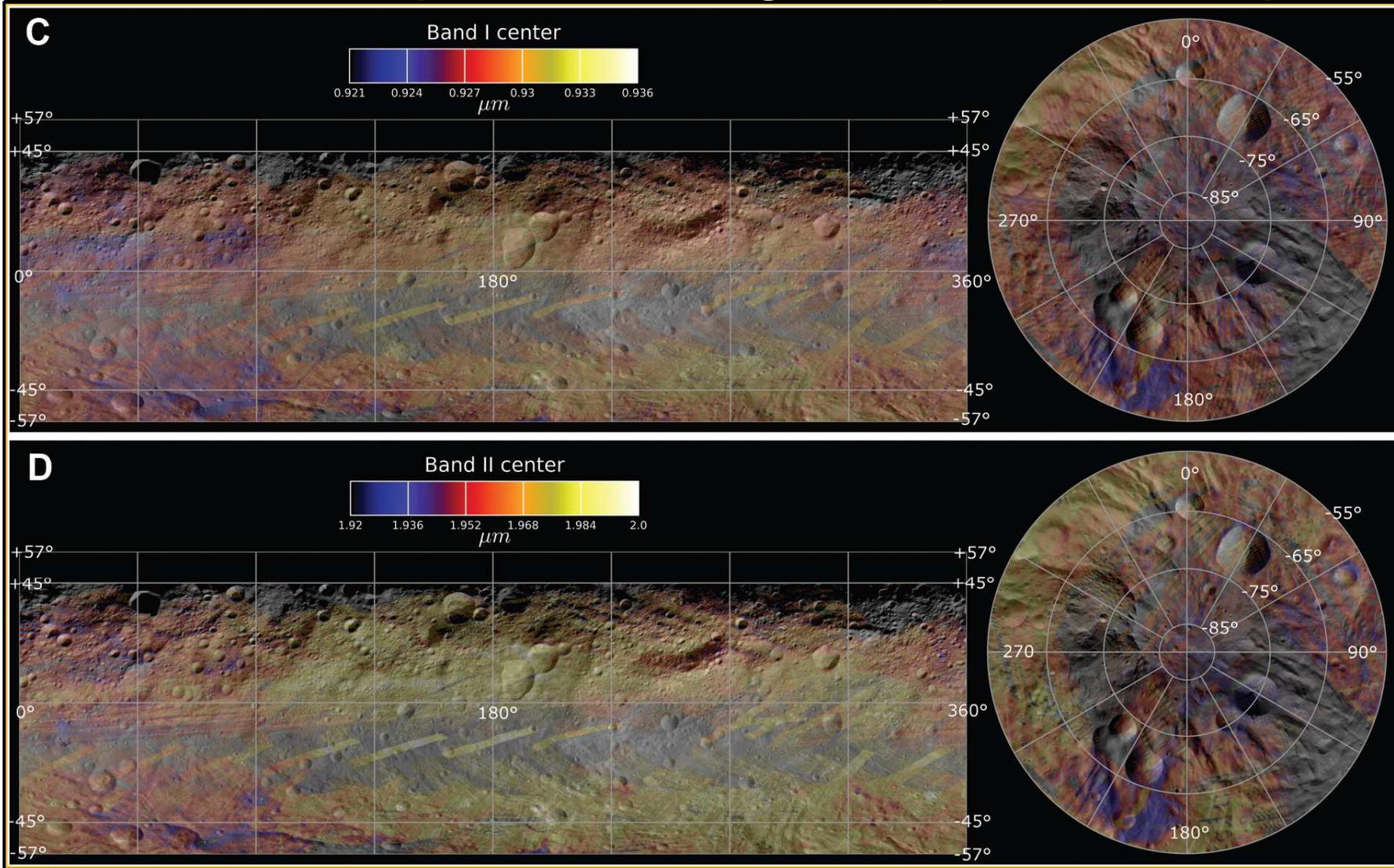
Stephan et al., JGR, 2014

Vesta Mineralogy

□ The Hemispherical and Regional Spectra Diversity



Italian Space Agency

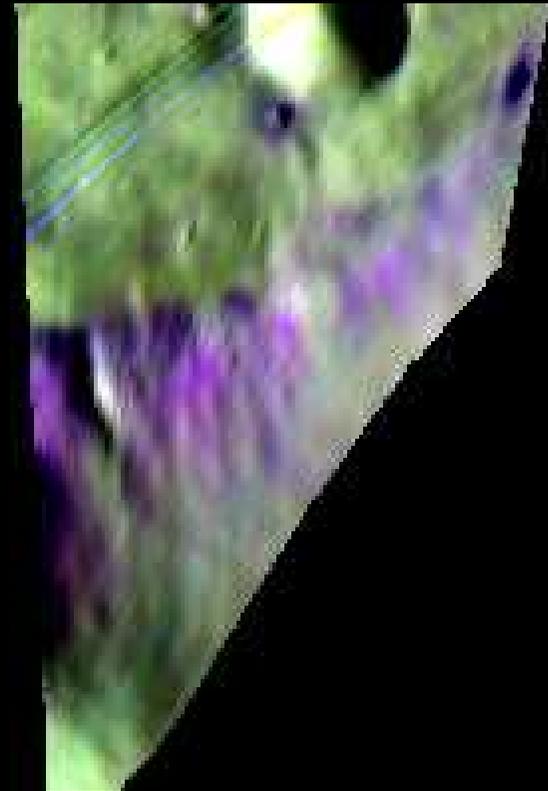


∞ 52nd STSC, 5 February 2015

De Sanctis et al., Science, 2012

Vesta Mineralogy

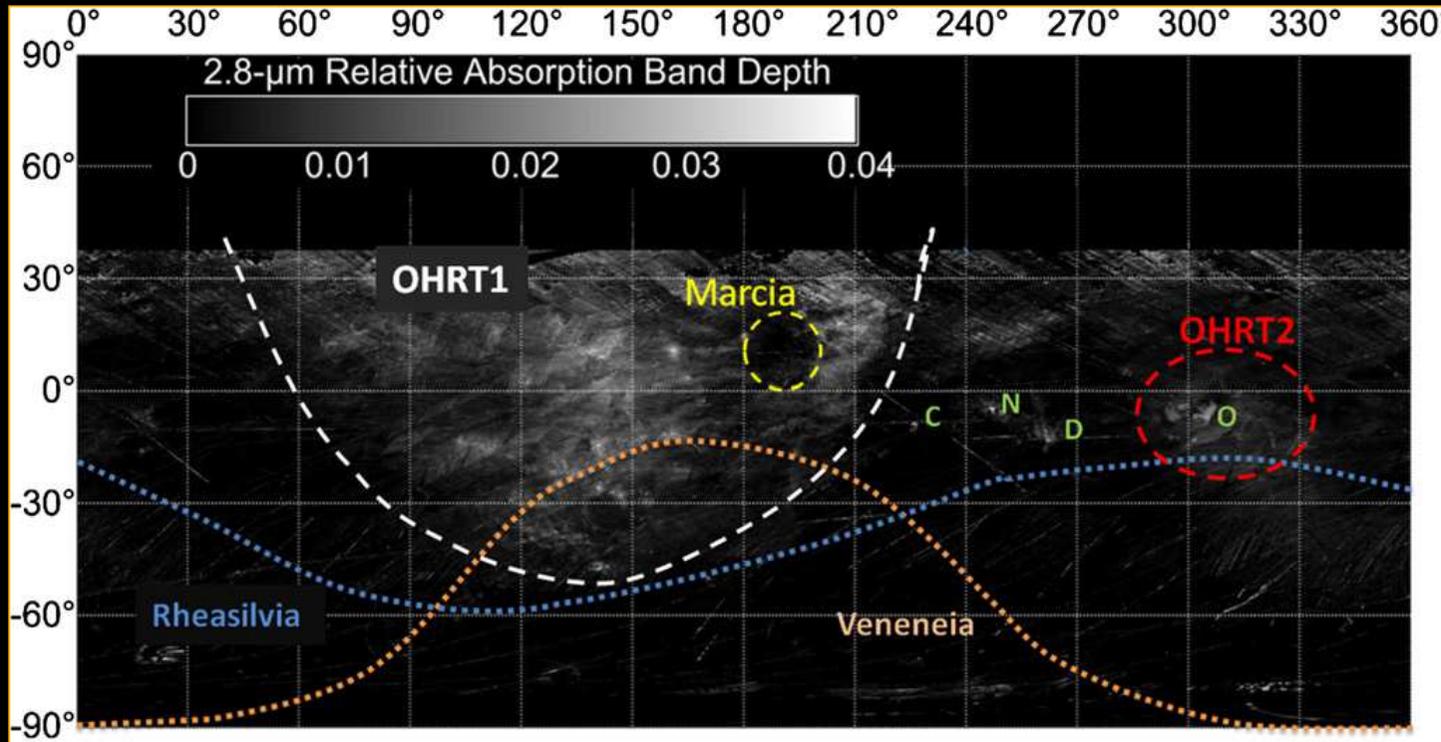
- Mineralogy associated with geology and stratigraphy
- Clear different material exposed on the slopes
- Lithological differences in the stratigraphy
- The scale of spectral variation indicates that Vesta's crust is compositionally variable at scales from a few tens meters to tens of km
- The differences at local scale were not foreseen before Dawn observations



Violet: deeper band depths
Green : shallower band depths

Vesta Mineralogy

OH Global Distribution

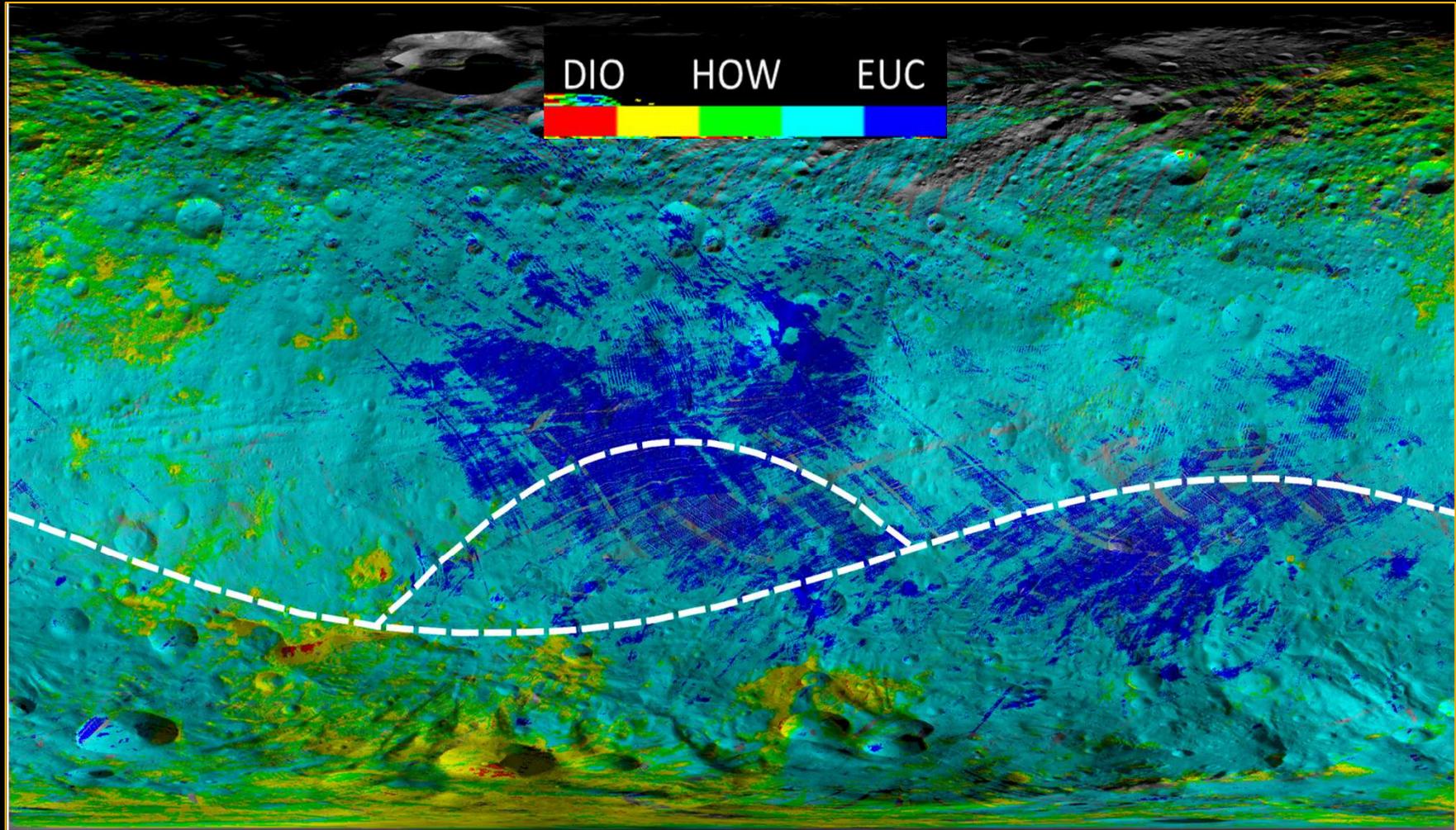


Observations of Vesta's surface composition by Dawn revealed the presence of OH in surface materials [De Sanctis et al., 2012] and elemental hydrogen [Prettyman et al., 2012]

The infall of OH-rich carbonaceous chondrite meteorites is the main hypothesis supported by this distribution

Vesta Mineralogy

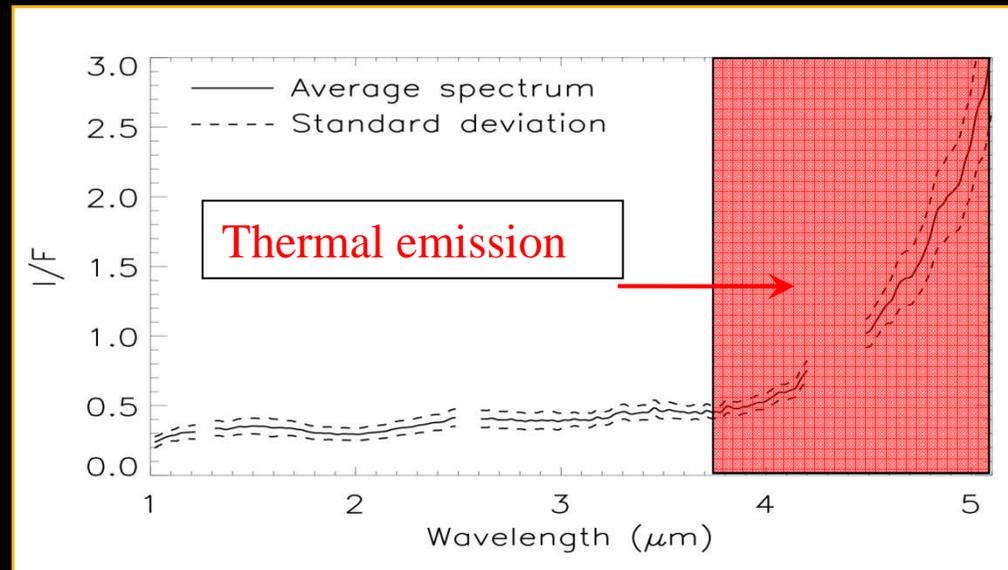
▣ Vesta/HED Connection



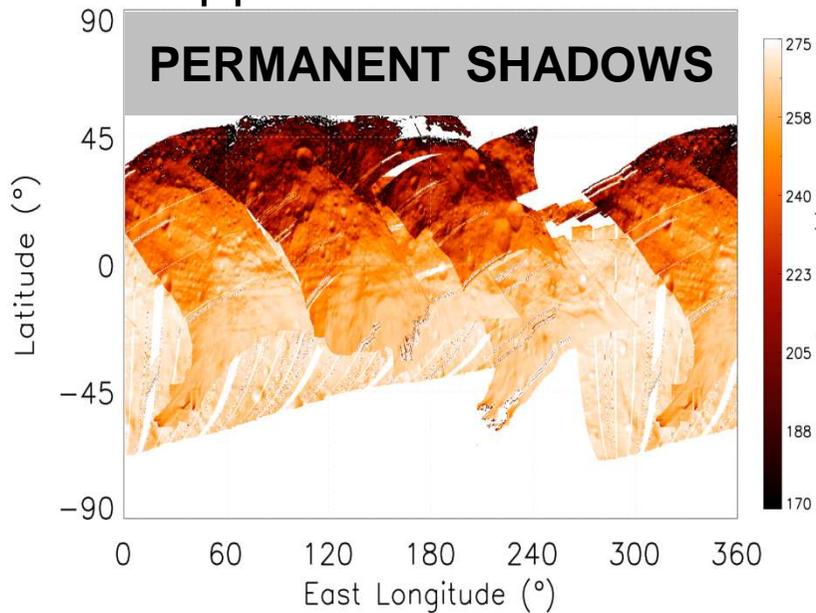
Ammannito et al., Nature, 2013

Vesta Surface Temperature mapping

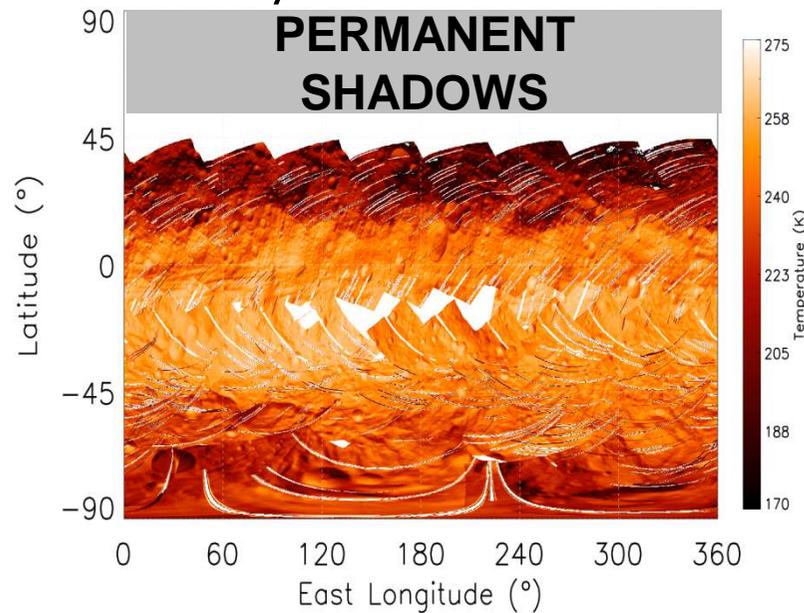
- To retrieve surface temperatures, we use the 4.5-5.1 μm portion of the infrared spectrum as measured by VIR.
- No temperatures below ~ 180 K can be safely retrieved by VIR. VIR data are strictly referred to the dayside of the asteroid and above this threshold.



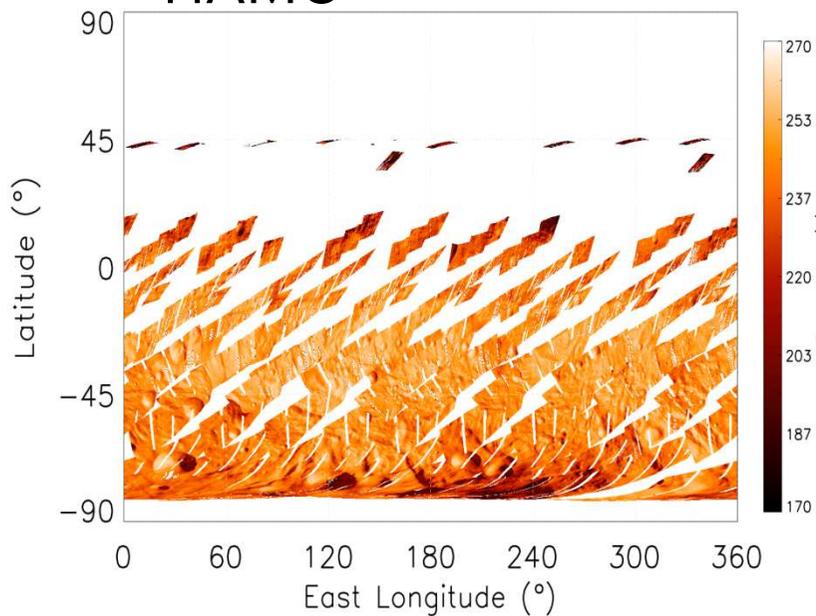
Approach



Survey



HAMO



LAMO



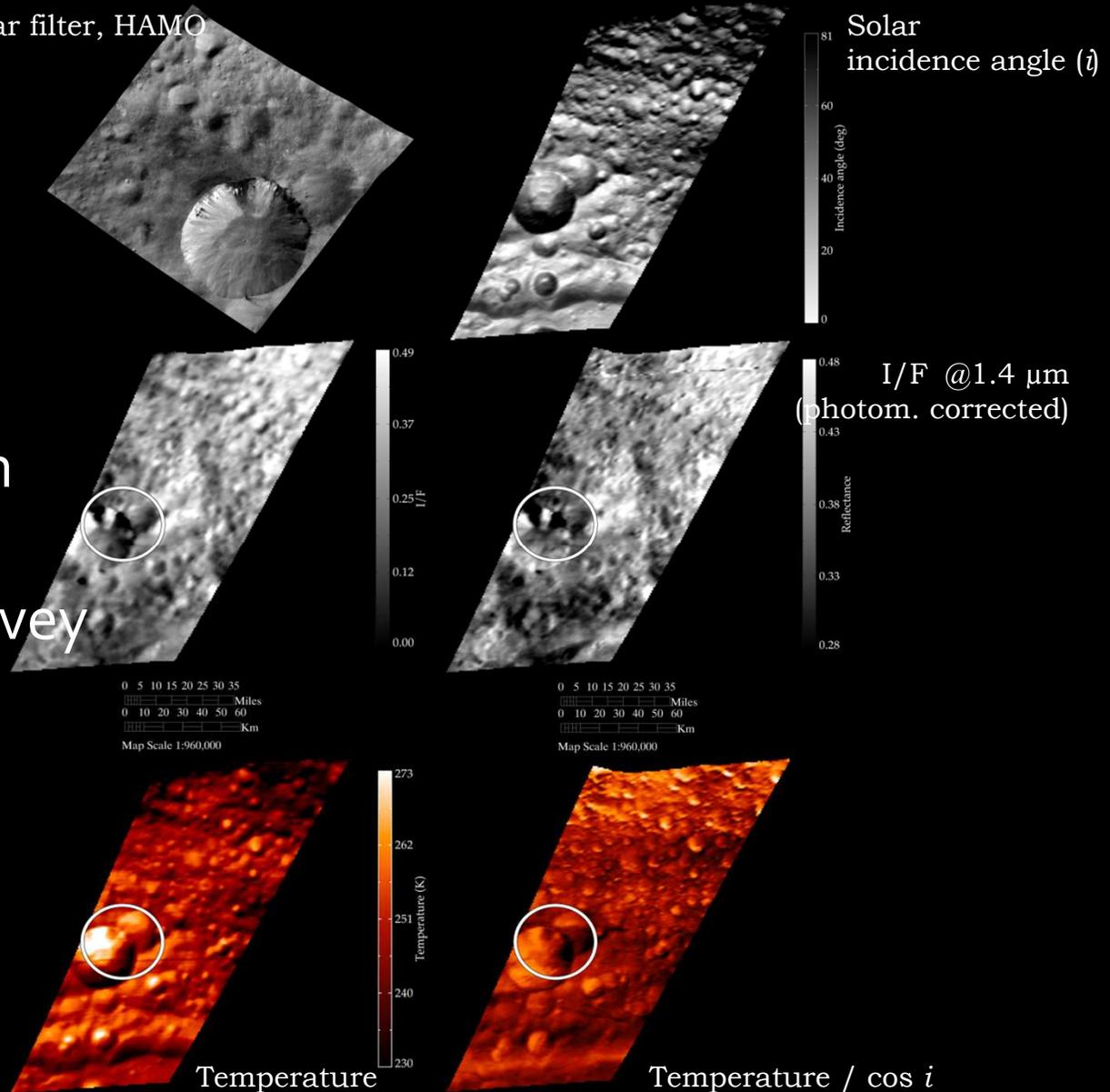
Close-ups from the data

FC clear filter, HAMO

VD7
(Numisia)
Lat = 3.5° S
Lon = 246.0° E
Diameter: 33 km

Observed in Survey
683 m/pixel
LST: 11.7 h
 $r_{\text{true}} = 2.25$ AU

Composition: Eucrite
(OH-enriched)



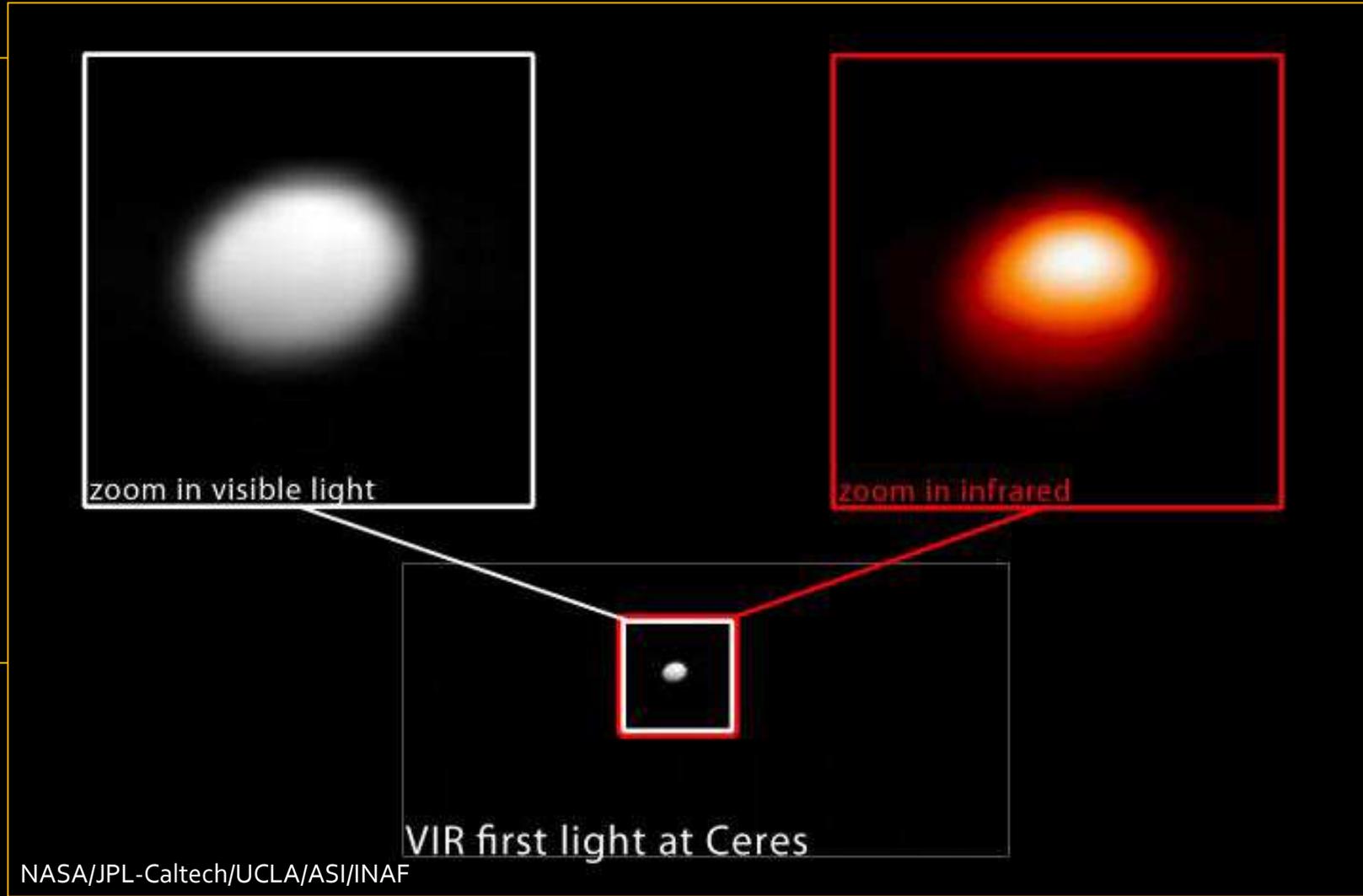
And now, Ceres!



Italian Space Agency

52nd STSC, 5 February 2015

5



To keep up with us:

<http://www.asi.it/en>

<http://www.iaps.inaf.it/solarsystem/>

http://www.esa.int/Our_Activities/Space_Science/Rosetta

<http://dawn.jpl.nasa.gov/>



We will always be grateful to Angioletta Coradini: a brilliant scientist who contributed deeply to Planetology, whose work is still providing data to be investigated by new generations of scientists - and will do so for many years to come

**THANK YOU
FOR YOUR
ATTENTION**