Venus Express searching for life – on Earth

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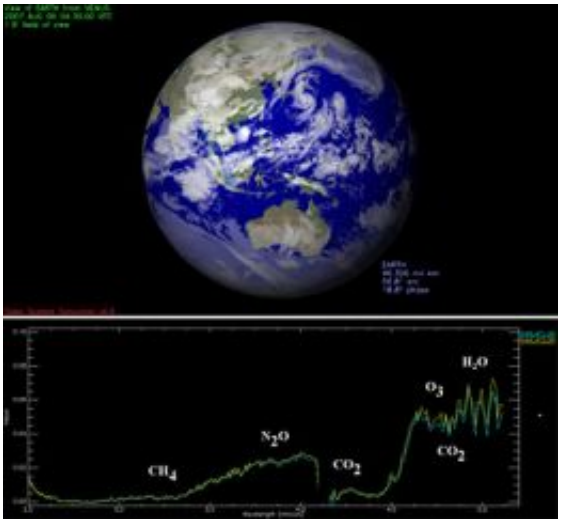

This image composite shows the signatures of methane (CH4), carbon dioxide (CO2), ozone (O3) and nitrous oxide (N2O), minor species of the Earth's atmosphere but powerful greenhouse gases, detected by the Visual and Infrared Thermal Imaging Spectrometer (VIRTIS) on board ESA's Venus Express at infrared wavelengths, while the spacecraft was pointing Earth along its orbit around Venus. Our planet was just a pixel in VIRTIS's field of view. The spectral signatures of these molecules, or chemical fingerprints, are shown for two observing sessions and are plotted by the two curves displayed in two different colours. During the observations Earth was showing to Venus Express the 'face' simulated in the image at the top. The light detected by VIRTIS is the thermal emission from the Earth's surface and, partially, the atmosphere. These observations are relevant as they proof that a distant planet such as an extra-solar planet can reveal to an instrument like VIRTIS the signatures of chemical compounds composing the atmosphere and surface. VIRTIS obtained these spectra on 5 and 6 August 2007. During these observations, Venus Express's distance from Earth was about 78 million km, while the spacecraft's distance from Venus was about 14 500 km. Credits: ESA/VIRTIS/INAF-IASF/Obs. de

Paris-LESIA (Earth views: Solar System Simulator JPL-NASA)

(PhysOrg.com) -- Scientists using ESA's Venus Express are trying to observe whether Earth is habitable. Silly, you might think, when we know that Earth is richly stocked with life. In fact, far from being a pointless exercise, Venus Express is paving the way for an exciting new era in astronomy.

Venus Express took its first image of Earth with its Visible and Infrared Thermal Imaging Spectrometer (VIRTIS) soon after its launch in November 2005. About a year after the spacecraft established itself in Venus's orbit, David Grinspoon, a Venus Express Interdisciplinary Scientist from the Denver Museum of Nature & Science, Colorado, suggested a programme of sustained Earth observation.

"When the Earth is in a good position, we observe it two or three times per month," says Giuseppe Piccioni, Venus Express VIRTIS Co-Principal Investigator, at IASF-INAF, Rome, Italy. The instrument has now amassed approximately 40 images of Earth over the last two years.

The images of Earth cover both visible and near-infrared regions of the spectrum and can be split into spectra, in order to search for the signature of molecules in the Earth's atmosphere.

The value of the images lies in the fact that Earth spans less than a pixel in Venus Express's cameras. In other words, it appears as a single dot with no visible surface details. This situation is something that astronomers expect to soon face in their quest for Earth-sized worlds around other stars.

"We want to know what can we discern about the Earth's habitability

based on such observations. Whatever we learn about Earth, we can then apply to the study of other worlds," says Grinspoon.

Since 1995, astronomers have been discovering these extrasolar planets and now know of more than three hundred. As observational techniques have been refined and the data continuously taken, so smaller and smaller planets have been discovered.

Now, with CNES–ESA's COROT and NASA's Kepler missions, the prospect of discovering Earth-sized worlds in Earth-like orbits around other stars is better than ever. "We are now on the verge of finding Earth-like planets," says Grinspoon.

As has been proved with the discovery of gas giant planets, as soon as astronomers know that they are there, they invent all sorts of innovative methods to separate the planet's feeble light from the overwhelming glare of the star.

One thing has become obvious from the study of Earth using Venus Express: determining whether a planet is habitable is not going to be easy. "We see water and molecular oxygen in Earth's atmosphere, but Venus also shows these signatures. So looking at these molecules is not enough," says Piccioni.

Instead, astronomers are going to have to search for more subtle signals, perhaps the so-called red edge caused by photosynthetic life. "Green plants are bright in the near infrared," says Grinspoon. The analysis to see whether this red edge is visible is just beginning.

The team will also compare spectra of the Earth's oceans with those taken when the continents are facing Venus Express. "We have initiated the first sustained programme of Earth observation from a distant platform," says Grinspoon. Although the observations may not tell us

anything new about the Earth, they will allow us to unveil far-off worlds, making them seem more real than simply dots of light.

Provided by ESA