EPSC Abstracts,
Vol. 4, EPSC2009-515-1, 2009
European Planetary Science Congress,

The Interactive Earth Datacube: a didactic online tool using VIR/VIRTIS data

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Abstract

In the following work we present a new didactic tool for planetary data visualization: the *Interactive Earth Datacube* that is being developed by INAF/IFSI and the Dawn EPO Team with the help of didactic specialists and teachers involved in the project.
The *Interactive Earth Datacube* is made using VIRTIS data and is an online free access tool both for undergraduated classes and for the general public to approach planetary science and imaging spectroscopy.

The scientific reference workframe is planetary science and in particular imaging spectroscopy used in planetary science for remote sensing.

In this science field, Imaging Spectrometers flying on many space missions in the solar system (from Cassini-Huygens to Rosetta and Dawn) are very sophisticated instruments that can acquire spectrally-resolved images of planets.

The output of these instruments is often referred to as a *datacube*. This is due to the three-dimensional representation of the data: in the *datacube*, two axes correspond to spatial dimension and the third is a spectral one (see Figure1). In other words, the output of Imaging Spectrometers are 3d data objects that combine images and spectra of planets from which many scientific information can be deduced. [1], [2]

To explain this scientific information to a generic public, Dawn EPO Staff had the idea of building an *Interactive Earth Datacube* using VIRTIS data (taken during the Rosetta mission Earth flyby) together with simulated data.

This *datacube* will be used to explore online the surface of Earth at different wavelengths. This hands-on activity will allow to verify many scientific concepts about our planet, such as, for example:

- the different mineralogical composition of the surface that can be interfered from the spectral signatures;
- how atmospheric composition can be deduced from the spectral absorption lines;
- the different physical behaviour of the day and night side of our planet that can be recognized by visual and infrared emission.

This *Interactive Earth Datacube* will be a very innovative and useful hands-on didactic tool, being at the same time:

- spectacular, since it uses images to explain scientific concepts;
- synthetic, summarizing many scientific information in one compact instrument easy to explore;
- interactive, since students will first look at the data, then they will be prompted to formulate some hypothesis to explain what they see, and then they will be guided to test these hypothesis exploring the *datacube* itself;
- didactic, teaching not online scientific concepts but also the scientific method that researchers have to follow during their inquiries.

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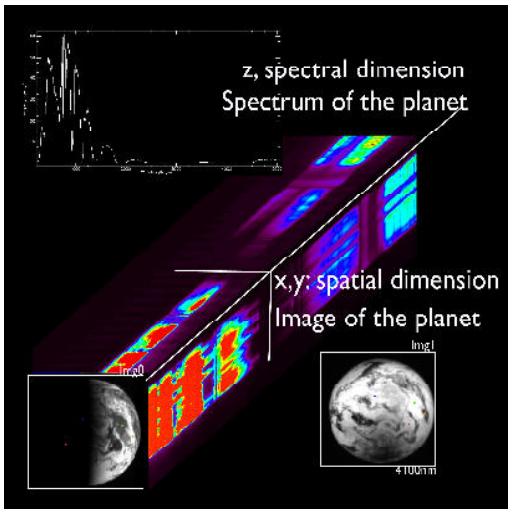

Figure 1: An artistic impression showing a representation of a VIRTIS/VIR *datacube* of the Earth. In the image, both spectral and spatial dimensions are showed.

References

[1] Coradini, A. et al (2007) *Space Science Reviews*, Volume 128, Issue 1-4, pp. 529-559

[2] Coradini, A. et al (2008), *39th Lunar and Planetary Science Conference*, Contribution No. 1391., p.1556