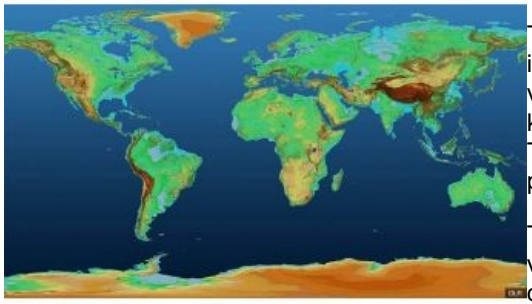
Satellites Create 3D Height Map of Earth



The German space agency (DLR) has released a 3D height map of Earth. Built from images acquired by two radar satellites (TerraSAR-X and TanDEM-X), it traces the variations in height across all land surfaces - an area totalling more than 148 million sq km. DLR is making the map free and open, enabling any scientist to download and use it. The map was made by the satellites sending down microwave pulses to the surface of the planet and then time how long the signals take to bounce back.

The shorter the time interval, the higher the ground. TerraSAR-X and TanDEM-X fly virtually side by side, sometimes coming to within 200m of each other. This is complex to control, but it gives the pair ‘stereo vision’, by allowing them to operate an interferometric mode in which one spacecraft acts as a transmitter/receiver and the other as a second receiver.

Precision

The resolution of the newly released digital elevation model (DEM) is 90m. The absolute accuracy in those squares in the vertical dimension is 1m, making the DEM a powerful rendering of all the Earth's lumps and bumps. There are DEMs that have far higher resolution on regional scales, but nothing on a global scale. DLR has other versions of the map whose sampling squares are 30m and 12m across, but these are, for the time being, commercially restricted.

Even though the satellites are getting old, DLR hopes to keep them running for a good few years yet, but planning for the replacements is in the advanced stages.

The Next Satellites

Future missions would be slightly different in that the radar instruments would operate not in the X-band but in the L-band - a longer wavelength. This would facilitate different types of applications.

“In forests, for example, in the X-band you get, more or less, the top of the canopy," explained Dr Manfred Zink from DLR's Microwaves and Radar Institute. "You don't penetrate and see under the leaves. But with the L-band we will penetrate; we will see the solid ground. That would enable us to see the vegetation volume in real 3D. We would see the full vertical structure of the forest and that is key for precise biomass estimates."