

Researchers Make More Accurate Observation of Earth System Possible

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Researchers at the Faculty of Aerospace Engineering of TU Delft have succeeded in modelling the **rotational behaviour of two satellites with unprecedented accuracy**. This makes it possible to model the orbit of the satellites much more accurately and this means that changes on earth observed by the satellite are also more accurate, for example, melting of the polar icecaps or the transport of water and atmospheric mass around the globe.

Satellites often have a rotational movement after being launched. This rotation and the mechanical characteristics of the satellites influence their orbits. This phenomenon was previously described using a number of (incidental) measurements and a rough model. The model created by the Delft PhD Student Nacho Andrés and his supervisor Ron Noomen, together with colleagues from the United States, Italy and Japan, removes much uncertainty about the behaviour of satellites.

The rotational movement of satellites varies in time, from rapid movement, to almost none at all. Both situations have very different consequences for the temperature distribution on the satellite's surface, and therefore on the size and direction of the so-called thermal forces that result from non-uniform heat radiation. These thermal forces are incredibly small, a factor 10¹³ smaller than the gravity that governs our everyday lives. Still, being able to calculate these small forces is important in the calculation of a satellite's orbit.

The model that the researchers of the department of Earth Observation

and Space Systems together with their international colleagues have developed, represents the orbital behaviour of the LAGEOS-1 and LAGEOS-2 satellites (launched in 1976 and 1992 respectively) with extreme accuracy (up to 1 cm). The model, called LOSSAM (LAGEOS Spin Axis Model), is based on independent observations of the rotation of satellites. It computes a whole range of forces that act on the satellites. LOSSAM provides an accuracy improvement of up to 50% over previous models. The new model is especially relevant for the rotational behaviour of LAGEOS-1 since 1998, because here, other models fail to produce results.

The research results have been published in a recent edition of the scientific Journal of Geophysical Research. In a follow-up project, the thermal and conductive characteristics of the satellites will be included, allowing a comprehensive thermal model to be constructed. This will, of course, further increase the accuracy of the model and therefore the satellites' readings.

Source: TU Delft

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