

# Analysis of the surface displacement of the Sumatra Earthquake by calculationg the position of GPS stations

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For high precise orbit determination demanded by earth observation geodetic satellite, Japan Aerospace Exploration Agency (JAXA) develops and operates a precise orbit determination system, which uses GPS (Global Positioning System) data and SLR (Satellite Laser Ranging) data.

In order to determine the orbit of a satellite with high accuracy, when we analyze data from GPS receiver mounted on satellite, we also analyze data of ground GPS stations and estimate the positions of the ground GPS stations. It is necessary to accurately fix the position of a ground GPS station and to identify position error and its sources on a daily basis for precise orbit determination. Because the position of a ground GPS station is constantly changing with tidal and oceanic load effects.

JAXA obtains GPS observation data from ground GPS stations installed by space organization of each country via the Internet, and use them for orbit determination of satellites at the JAXA Tsukuba Space Center.

In our daily orbit determination, we detected the surface displacement which was likely caused by the Sumatra Earthquake, which happened near the Sumatra island sea at around 10 AM (Japanese Standard Time) on 26th December 2004.

For the GPS station (NTUS) nearest to the hypocenter among the GPS stations JAXA uses for orbit determination, our calculation of the position shows that GPS station moved about 2 cm west and about 1 cm downward. For DGAR GPS station, which is located opposite to the NTUS station with respect to the hypocenter, it moved about 1cm east. In short, the earth surface moved a few cm closer to the hypocenter from east and west. In this symposium, we report our analysis and results.

