

Report
of the
Working Group
on
‘Analysis of Environmental Data for the Interpretation of Gravity Measurements‘

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This working group, in which the influence of the environment on terrestrial geodynamic observations is studied, is now in its seventh year of existence. During this period two developments have emerged: 1. an increasing number of effects due to the environment need to be considered, and 2. even known effects still need to be studied more closely as the observations become more refined. These developments became esp. clear during a workshop in Jena, March 11 – 15, 2002, which was shared by the working group and the Global Geodynamics Project. In all, 39 scientists from 16 countries participated. Papers presented by the participants are published by the International Center for Earth Tides' Bulletin d'Informations des Marées Terrestres, vol. 135 - 137. The importance of environmental influences in geodynamic observations was likewise topic of a number of presentations and discussions during the 15th Earth Tide Symposium in Ottawa this year. At the business meeting of the conference it was decided to change the working group into a study group of the IAG Sub-commission 3.1 Earth Tides, as the understanding of environmental effects is a dynamic research topic which requires long-term studies and cannot be finished within a defined period.

Whereas the first term of report was characterised by the studies focusing on effects due to mass movements in the atmosphere, within the recent term the importance of hydrological influences on observations was recognized. This is also reflected in the recommendations and proposals by the working group. Main results of the discussions were:

- Concerning the barometric pressure influence on gravity indications exist that vertical density variations could be of importance.
- At a number of gravimeter stations located in bedrock hydrological effects on gravity can be observed. It is not entirely clear, where these effects originate from as usually clefts and fissures are too small to allow larger hydrological variations.
- The influence of hydrological fluctuations on gravity needs to be studied more closely. It is recommended that at least precipitation measurements are carried out at each station. A fundamentally better understanding of the hydrological situation at an observatory can be obtained if precipitation, groundwater table, and soil moisture changes are observed.
- For studies of long-periodic gravity variations fluctuations in the continental water storage and in the water mass of the oceans need to be considered in addition to large-scale barometric pressure variations.
- It was recommended to ask the recently established 'Special Bureau for Loading' to provide global barometric pressure corrections and corrections for continental water storage and water mass in the oceans for all GGP stations, thus making a standard correction available for these effects. This contact has been made.
- The monitoring of soil moisture variations is a problem, because either soil moisture variations of different depths or an integrated soil moisture value seems to be needed. In addition, it is not clear up to which extend such a value is representative for its surroundings. Regarding these two issues principle studies are required.

- The physical mechanism between environmental variation and signal in tilt or strain often is still uncertain, for at a single station already quite a number of different effects due to the same environmental parameter can be observed. Therefore it is recommended that observatories, in which gravity, tilt, strain, and a number of environmental parameters are monitored, should carry out case studies.

Studies regarding the last item are already carried out by some observatories suitable for this. With regard to the monitoring of hydrological parameters it is necessary to collect information from groups already carrying out this kind of observations in order to give recommendations for an adequate monitoring.