

Final Report for 1997-2000
of the
IAG/ETC Working Group 6
Solid Earth tides in space geodetic techniques

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Foreword

Within the Earth Tides Commission (ETC) of the International Association of Geodesy (IAG) the Working Group 6 ‘Solid Earth tides in space geodetic techniques’ was established at the 13th International Symposium on Earth Tides, Brussels, July 1997. The general goal of the WG was to strengthen the links between researchers of the tidal community and those who work in space geodetic techniques. The cooperation had to be taken place in both directions:

- The tidal experts provide precise models for the displacements of observation sites on the Earth’s crust due to the tides and for the tidal variations to the gravitational field of the Earth.
- The space geodetic techniques are used to validate and possibly to improve the tidal models, e.g. the tidal parameters.

For the investigation of the solid Earth tides it is necessary to take also into account other geophysical influences, e.g. those of the oceans, of the atmosphere and of the pole-tide. Thus, oceanic and atmospheric loading, oceanic and atmospheric effects on the geopotential and the pole-tide were regarded by the Working Group, too. Chairman, members and correspondents of WG 6 (status August 2000) are given in the Activity Report of WG 6 (Schuh, BIM 2001).

The following Terms of Reference (ToR) were agreed upon by the members of WG 6:

1. Extension of the recommendations concerning the tidal influences given in the IERS Conventions (1996) to facilitate their practical use for space geodetic techniques.
2. Evaluation and comparison of the potential of different space geodetic techniques to monitor tidal effects and to determine tidal parameters. Techniques such as VLBI, SLR, LLR, GPS and GLONASS, DORIS and PRARE, satellite altimetry will be covered.
3. Determination of parameters of the tidal models by space geodetic techniques. This requires a priori corrections due to atmospheric and oceanic influences on the Earth’s surface and on the geopotential and precise models for tidal influences on the Earth orientation parameters. The effect of pole-tide has also to be considered. The results will have to be compared and interpreted.

The work on the 1. Term of Reference was summarized and published in: Explanatory Supplement to the IERS Conventions (1996) Chapters 6 and 7, ed. by H. Schuh, *DGFI Report 71*: <http://www.dgfi.badw.de/dgfi/DOC/report71.pdf>, 1999.

The activities for the 2. and 3. Term of Reference started in summer 1999. Subgroups were established in September 1999 to evaluate the different space geodetic techniques (VLBI, SLR, LLR, GPS/Glonass, DORIS, satellite altimetry) with respect to their potential to monitor tidal effects and to determine tidal parameters. The subgroups were also open for non-members of the WG. The following questions were addressed by the subgroups:

1. Which tidal effects have to be considered in the particular space technique?
2. How is the ‘permanent tide problem‘ handled?
3. What is the capability of the particular space technique to investigate tidal effects (including oceanic and atmospheric tides) and to determine tidal parameters, e.g. the Love numbers?
4. What are the newest results?
5. What are the limitations?
6. What are the future perspectives?

The results of the individual subgroups on six different space geodetic techniques of WG 6 (VLBI, SLR, LLR, GPS/Glonass, DORIS, satellite altimetry) for the years 1997 till 2000 are presented in this Final Report. They show that all space geodetic techniques provide interesting information about tidal effects. Comparison of the treatment of tidal effects in different software packages revealed considerable discrepancies even within the same technique (e.g. between GPS software packages, between VLBI software packages, between LLR software packages, ...). New results for the tidal parameters were obtained for all techniques.

Finally, the chairman (for 1997-2000) wants to express his gratitude to all individuals who contributed to the success of Working Group 6. At the 14th International Symposium on Earth Tides in Mizusawa, Japan (September 2000) it was decided that Working Group 6 will continue its activities for another term and Dr. Wu Bin (Wuhan, China) was determined as the new chairman. As the former chairman I’d like to wish him and the WG 6 all the best for the future.

Harald Schuh (Vienna, June 2001)

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