Editorial note for the Geodesy and Geodynamics journal special issue

Contemporary Research in Geodynamics and Earth Tides: An account of the 18th Geodynamics and Earth Tides Symposium 2016, Trieste, Italy

This volume aims at conveying the rich and interdisciplinary topics discussed at the 18th Geodynamics and Earth Tides Symposium, Trieste, 2016 (Fig. 1). For seventeen times the gathering was named the Earth Tides Symposium, when giving tribute to the evolution of the observed signals, the term geodynamics was added to the title. In Table 1 the full list of the symposia is shown.

The Symposium was very successful, with over 110 attendants from all over the world. The big hall in the University of Trieste and the city of Trieste were a excellent venue location, appreciated by the participants and documented through the words of the scientific board (Appendix 1).

The presentations at the symposium were grouped according to the topics found in Table 2 and were all held in a single session, which guaranteed a large audience throughout the symposium and lively active participation for all the cross-disciplinary presentations (Figs. 1–2).

The present volume aims at a full coverage of the Symposium by including the entire list of abstracts that were presented either as oral or poster presentations. Where applicable, the publications in the journals Geodesy and Geodynamics and in Pure and Applied Geophysics are linked with the abstract. These two journals published a special volume each on the topic of Geodynamics and Earth Tides. The present special volume of Geodesy and Geodynamics is dedicated to the coverage of the Symposium. Pure and Applied Geophysics opened a public call on the subject. Between the two journals, 31 interesting papers can be found.

A synthesis of the meeting is given in Braitenberg [1] in form of a review of the topics relevant to the Symposium. The procedure to control the scalar factor and drift of a superconducting gravity meter using observation of a tidal wave and other gravity meters is presented by Meurers [2]. The excellent drift properties and new software for the Automated Burris Spring Gravity meter are presented by Jentzsch et al. [3] and Schulz [4]. The processing of a GNSS network with a Kalman filter to extract station displacements, velocities and accelerations is described in Shults and Annenkov [5]. Hydrologic effects in tilt, strain and gravity measurements are either relevant for estimating hydrologic properties, or for reducing the observations for these effects. The detection of pore pressure changes induced by hydrologic pumping is recorded with tilt and strain observations at the geodetic station Moxa (Germany) and explained in Jahr [6]. Papp et al. [7] investigate the dependency of tidal parameters in gravity measurements across the Pannonian basin. Geodynamic thermomechanical modeling of the subduction of the central Andes is presented by Salomon [8], while Hazrati-Kashi et al. [9] study inversion methods to define slow slip during the preparing phase of a large scale earthquake at subduction zones. The field trip of the Symposium illustrated the tilting induced by hydrologic flows in the channel system of the classical Karst rising behind the city of Trieste and an impressive river emerging at the foot of the Karst (Braitenberg et al. [10]).

Table 1

<table>
<thead>
<tr>
<th>The Earth Tides Symposia since 1957. In 2016 the topic was broadened to International Symposium on Geodynamics and Earth Tides.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
</tr>
<tr>
<td>5.</td>
</tr>
<tr>
<td>11.</td>
</tr>
<tr>
<td>14.</td>
</tr>
<tr>
<td>15.</td>
</tr>
<tr>
<td>17.</td>
</tr>
<tr>
<td>18.</td>
</tr>
</tbody>
</table>

Table 2

<table>
<thead>
<tr>
<th>Scientific sessions of the 2016 symposium and the conveners.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session</td>
</tr>
<tr>
<td>1 Tides and non tidal loading</td>
</tr>
<tr>
<td>2 Geodynamics and the earthquake cycle</td>
</tr>
<tr>
<td>3 Variations in Earth rotation</td>
</tr>
<tr>
<td>4 Tides in Space geodetic observations</td>
</tr>
<tr>
<td>5 Volcano geodesy</td>
</tr>
<tr>
<td>6 Natural and anthropogenic subsurface fluid effects</td>
</tr>
<tr>
<td>7 Instrument and software developments</td>
</tr>
</tbody>
</table>

© 2018 Institute of Seismology, China Earthquake Administration, etc. Production and hosting by Elsevier B.V. on behalf of KeAi Communications Co., Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
The Topical Volume published in Pure and Applied Geophysics opens with two studies on the Earth's core resonance at diurnal periods, with Agnew [11] finding that the resonance can be seen in ocean tidal gauge records, and Ban et al. [12] discussing its observation in quartz tube extensometers. A theoretical paper on the deformation of the Earth in response to tidal forces, for analyzing rheologic properties is given by Varga et al. [13]. Another theoretical paper addresses the earthquake triggering effect of Earth tides (Varga and Grafarend [14]).

New instrumental developments for laser strainmeters installed in the Canfranc station, Spain are presented by Amoruso et al. [15] and for interferometric tiltmeters by Ruotsalainen [16], respectively. The sophisticated geodetic instruments sense the loading effect and changing mass in river estuaries; the modeling of this effect for a geodetic reference station in Argentina is shown in Oreiro et al. [17]. The modeling of the hydrologic induced gravity signals at the station Moxa are discussed in Weise and Jahr [18], with the aim of improving the match to the gravity changes observed by satellites GRACE. The hydrologic signal in tilt and GNSS in a seismic karst area is described in Grillo et al. [19]. The tidal response in confined aquifers is discussed in Vinogradov et al. [20]. Rosat et al. [21] analyze continuous gravity observations made at the sea-floor for natural gas reservoir monitoring, defining the noise level after the data have been corrected for ocean and solid Earth tide models. The method of empirical mode decomposition and independent component analysis is proposed as a tidal analysis method for gravity time-series (Yu et al. [22]). Three colocated superconducting gravimeters are analyzed together, finding surprising differences in the time series, ascribed to the local hydrology (Virtanen and Raja-Halli [23]). The cryogenic gravimeters...
have highest precision, and require particular attention for checking scale factors and instrumental drift. Details on the calibration procedure through absolute gravimeters is explained in Crossley et al. [24]. Karbon et al. [25] formulate a new model for the short-period ocean tidal variations in Earth rotation.

Space geodetic observations as GNSS have the drawback of being less sensitive to deformation at local scale, compared to the sophisticated high precision gravity and deformation measurements, but have the advantage of easier installation, reaching dense and global coverage. The studies included in the volume are concerned with identifying hydrologic and temperature effects, developing modern spatio-temporal analysis methods (Gruzschnzyna et al. [26]; Klos et al. [27], Gruszczynski et al. [28]) or identifying non-hydrologic common GNSS transient signals (Rossi et al. [29]).

The deformation at an active volcano (Elbruz, Caucasus) (Milyukov et al. [30]) and for a big earthquake (Gorkha, Nepal) (Morsut et al. [31]), demonstrates the importance of geodetic monitoring in hazard assessment.

A special event at the Symposium was the nomination of the Paul Melchior medalist. The Paul Melchior medal has been given since 1997 at the Earth Tide Symposia, awarding the outstanding scientists with a huge experience and influence in the Tide Community. The previous Awardees are:

Paul Melchior (1997, Bruxelles, Belgium).
Houtse Hsu (2013, Warsaw, Poland).

After a 2-step procedure the 2016 Paul Melchior Medal was assigned to Trevor F. Baker. In the Appendix 2 the scientific achievements of Trevor F. Baker as prepared by B. Ducarme are found. During the ceremony W. Zürn read the laudatio (Appendix 3).

The Scientific Panel invites all interested readers to the next Geodynamics and Earth Tides Symposium, which is planned to be held in Wuhan, China in the year 2020.

Acknowledgements

The Symposium was scientifically supported by the IAG: Commission 3, the IAG Sub-commission 3.1 and International Geodynamics and Earth Tide Service. The University of Trieste and the sponsors of the Symposium, namely the OGS (Istituto Nazionale de Oceanografia e di Geofisica Sperimentale), the Dipartimento di Fisica E. Caianiello, University of Salerno, the Department of Mathematics and Geosciences of the University of Trieste, Leica Geosystems S.P.A., International Association of Geodesy (3 IAG Travel Awards for young scientists), the European Geosciences Union (support to 8 young scientists), the Rector Maurizio Fermeglia of the University of Trieste and the President Maria Cristina Pedicchio of OGS, are gratefully acknowledged for supporting this event. We thank the organizational Secretariat "The Office" (http://www.theoffice.it/) for perfect assistance in all phases of the Symposium.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.geodi.2018.03.001.

References


C. Braitenberg, G. Rossi, J. Bogusz, L. Crescentini, D. Crossley, R.S. Gross, K. Heki, J. Hinderer, T. Jahr, B. Meurers, H. Schuh

* Corresponding author. University of Trieste, Department of Mathematics and Geosciences, Via Weiss 1, 34100, Trieste, Italy. E-mail address: berg@units.it (C. Braitenberg).

Available online 3 April 2018