SECTION V—GEODYNAMICS

REPORT FOR THE PERIOD 1991-995

Jean O. Dickey
Jet Propulsion Laboratory
California Institute of Technology
4800 Oak Grove Drive
Pasadena, CA 91109-8099

INTRODUCTION AND STRUCTURE
Section V “Geodynamics” is concerned with a broad variety of activities, namely:
• monitoring and study of time dependent geophysical phenomena, including Earth orientation (Earth rotation, polar motion, precession and nutation), crustal motion, variations of gravity and seafloor topography, including microwaves; 
• geophysical interpretation of gravity and related data; 
• reference systems; 
• geodetic aspects of international geodynamic projects.

The objectives are three-fold:
• to encourage research in all relevant areas; 
• to provide a forum for discussion; and
• to promote and coordinate international cooperation both within the IAG and with other international organizations.

The structure consists of two commissions and one special commission, nine special study groups, and five services (see Table 1). In addition, an Ad Hoc Working Group on Global Change and an Ad Hoc Planning Group on the Global Change of Sea Level and Ice Sheet Volume Variations were formed under the leadership of Section V (see Table 1). Also, a review board for the International Center for Recent (Justal Movements) was established with a goal of evaluating, need and modernizing activities.

<table>
<thead>
<tr>
<th>Commissions, Special Commission and Ad Hoc Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commission V: Earth Tides</td>
</tr>
<tr>
<td>President: T. I. Sato</td>
</tr>
<tr>
<td>Commission VII: Recent Crustal Movements</td>
</tr>
<tr>
<td>President: T. Tanaka</td>
</tr>
<tr>
<td>Special Commission SI: Fundamental Constants</td>
</tr>
<tr>
<td>President: M. H. Fujii</td>
</tr>
<tr>
<td>IAG Ad Hoc Working Group on Global Change</td>
</tr>
<tr>
<td>I. Dickey</td>
</tr>
<tr>
<td>IAG Ad Hoc Planning Group on Sea Level and Ice Sheet Volume Variations</td>
</tr>
<tr>
<td>J. O. Dickey</td>
</tr>
</tbody>
</table>

Table 1. Commissions, Special Commission and Ad Hoc Groups

HIGHLIGHTS OF ACCOMPLISHMENTS
The past four years has been a productive period with advances on many fronts in a broad range of activities. Because of space limitation, we will only highlight a few activities; the reader is referred to the individual reports for full discussion.
Special Study Groups

SSG 5.143: Rapid Earth Rotation Variations
Chairman: J. O. Delheye, (Joint with IAU)

SSG 5.144: Dynamic Effects in Earth Rotation
Chairman: S. Molodensky

SSG 5.145: Long-Term Variations in Earth Rotation
("Himmels", Brosche"

SSG 5.146: Processing of Optical Polar Motion in View of PlumbLine Variations
Chairman: P. Paquet

SSG 5.147: Studies of the Baltic Sea
Chairman: J. Kakkuri

SSG 5.148: Global Geodynamic Variations
Chairman: M. Chao

SSG 5.149: Studies on Vertical Datums (with IAPSO)
Chairman: E. Groten

SSG 5.150: Density Distribution within the Lithosphere
Chairman: H. G. Kahle

SSG 5.151: Geodetic Research Toward the Reduction of Natural Hazards
Chairman: S. Okubo

Table 1. Special Study Groups

International Services Reporting to Section V

International Centre for Earth Tides (affiliated with FAGS)
Director: P. Melchior

International Centre of Recent Crustal Movements
Director: P. Vyskocil

International Earth Rotation Service (affiliated with FAGS)
President: Y. Yatskiv
Director of the Central Bureau: M. Feissel

Permanent Service for Mean Sea Level (affiliated with FAGS)
Director: P. E. Woodworth

Time Section, Bureau International des Poids et Mesures
Director: C. Thomas

Table 3. International Services Reporting to Section V
An Ad Hoc IAG Working Group on Global Change, formed under the leadership of Section V as a result of discussion, held at the IUGG General Assembly in Vienna (August, 1991), recommended in a position paper presented at the IAG Executive Committee Meeting (March, 1992, Ohio State University) that IAG take an active leadership role in global change research, particularly in the International Geosphere-Biosphere Program (IGBP). The suggested target of activity was 'scale:level and ice sheet volume variations', which are key topics in global change and where geodesy certainly plays a critical role. As a result, an Ad Hoc Planning Group on Sea Level and Ice Sheet Volume Variations was formed with an objective of coordination of existing activities and an ultimate goal of proposing it as a separate program or linking it to an IGBP 'core program. This group has been successful in having "Determination of the Rates, Causes and Impacts of Sea Level Change" included as a Framework Activity within the newly formed Core Project, Land-Ocean Interactions in the Coastal Zone (LOICZ). Sea level issues have also been addressed by SSG 5.149, "Studies on Vertical Datums" and by SSG 5.147, "Studies of the Baltic Sea"; the latter has been active in coordinating special campaigns utilizing 35 sites bordering the Baltic Sea. These efforts will be carried forward for the next term under the leadership of W. F. Carter with a Special Committee on Sea Level and Ice Sheet Volume Variations.

Section V also deals with the mitigation of natural hazards through the SSG 5.151, formed in March, 1992. The objectives are to provide theoretical, observational and instrumental background for optimal retrieval of geodetic information on earthquakes, volcanic eruptions and landslides. The use of both conventional as well as new innovative techniques such as Interferometric SAR (Synthetic Aperture Radar) has been stressed.

Advances have been made in improving these services. During the latter part of the term, the IERS has improved significantly the accuracy of both the International Terrestrial and Celestial Reference Frames (ITRF and ICRF) and has incorporated the GL Technique in polar motion and reference frame determination (cooperation with International GPS Service (IGS)). In addition, the IERS is looking forward to the next millennium, reevaluating its mission and goals. Special campaigns (such as SHARE92 and COST94), coordinated by the IERS and advocated by SSG 5-143, have provided highly accurate subdaily measurements enabling new insights into solid Earth-atmosphere-ocen interactions. TOPEX and ERS-1 measurements of ocean surface temperature anomalies are augmenting conventional tide gauge measurements of sealevel change (see Woolworth, this volume).

Section V also examined mechanisms to improve these services. A Review Board (see introduction) recommended that the establishment of a Crustal Deformation Bureau be considered; this bureau would reconstruct and enlarge the services that are currently available through the International Center of Recent Crustal Movements. An Ad Hoc Planning Group on Crustal Deformation, formed at Boulder under the leadership of W. F. Carter, will consider the formation and structure of this bureau, as well as the modernization of the Recent Crustal Movements Commission.

ACKNOWLEDGMENTS

The author gratefully acknowledges the active role played by the leadership and membership of the various organizations within Section V (Table 1.3). The work of the author presents the results of one phase of research carried out at the Jet Propulsion Laboratory, California Institute of Technology, sponsored by the National Aeronautics and Space Administration.