REPORT ON THE WORLD SPACE CONGRESS

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ABSTRACT. The World Space Congress comprised of the 43rd Congress of the International Astronautical Federation (IAF) and the 29th Plenary Meeting of the Committee of Space Research (COSPAR) was held in Washington, DC from 27 August to 4 September, 1992. Over 3000 people participated in the meetings where scientific papers were presented on such diverse topics as space travel, biological aspects of space travel, relativity, planetary atmospheres, space debris, space law, global change, launch vehicles, space station, space communication, navigation, Earth rotation, astrometry, satellite geodesy, use of lunar observations, and new observational techniques. Presentations dealing with the topics of this symposium are discussed, but complete reports will be forthcoming in the proceedings of the Congress.

1. EARTH ORIENTATION

High time-resolution measurements of Earth orientation with all space techniques are being made and coordinated through the International Earth Rotation Service. Very long baseline interferometry (VLBI) should achieve ±0.1 milliarcsecond accuracies in 1996 with processing delays of 24 hours. The monitoring of Global Positioning System (GPS) satellites may provide polar motion at two to six-hour intervals, and single-baseline VLBI may provide UT1 at similar intervals. New satellites (ERS-1 and UARS) are now providing an opportunity for wind measurements and related surface stresses. In 2000 superfluid gyroscopes may provide continuous polar motion and UT1 for weeks with VLBI being required to monitor precession, nutation and for reference frame maintenance.

Improvements in terrestrial reference frame definition will require improved global coverage of sites, but the celestial reference frame is being realized by positions of extragalactic compact radio sources with one milliarcsecond internal precision and drift uncertainty less than one milliarcsecond per year. Lunar laser ranging may still be the most effective way to produce a Dynamical reference frame.

I.I. Mueller and B. Kołaczek (eds.),
Developments in Astrometry and Their Impact on Astrophysics and Geodynamics, 435–437.

Recent research in Earth rotation has shown that diurnal and semi-diurnal variations appear to be largely tidal in nature and that about 10% of decade length of day (LOD) variations are due to climate and 70% due to electromagnetic coupling of core and mantle. A more complete investigation of the effect of the core on the Earth's rotation requires more theoretical work and three-component measures of the magnetic field. New ocean data may provide the "missing excitation" in LOD variations with periods from six hours to ten days, but bottom pressure measures are required for a more thorough investigation.

Resonance effects induced by free oscillations on the forced nutations are being studied along with atmospheric loading effects on annual and semi-annual nutation. Variation in J_2 and J_4 can be measured, and appear to be related to post-glacial rebound and/or ice volume variations. Use of satellite techniques to study long-term changes in the Earth's rotation and shape are hampered by atmospheric models.

In the future it is expected that efforts will be undertaken to make geodetic measurements on the edge of ice sheets, and continue high time-resolution Earth orientation. These will involve increased use of GPS data as well as ocean data

2. SATELLITE GEODESY

Satellite geodesy is now employing more satellites, more monitoring stations and using one to two-day arcs in the analysis of tracking data. A major source of error is the ionosphere, and new endeavors include drag-free satellites and improved GPS reference fields. Improvement in the satellite determination of polar motion by a factor of ten is expected. A major contributor to this improvement is the expected reference frame improvement which would be helped by deployment of Rogue receivers in Asia. It would also be beneficial to have laser ranging to GPS satellites, particularly to understand non-gravitational forces.

GPS will play an important part in positioning many space activities, and already terrestrial positioning to tens of centimeters is becoming routinely achievable. Solar radiation effects remain a major source of error, but GPS should provide polar motion with ±0.1-0.5 millisecond of arc accuracy. Current problems in the modelling of polar motion derived from GPS orbits may be due to inadequate editing of data

3. ASTROMETRY

In astrometry HIPPARCOS will continue to have adequate power until 1994. A catalog of 120,000 stars has already been observed several times and 800,000 stars of TYCHO will have ten millisecond-of-arc positions. An orbiting optical interferometer was described with a seven-meter baseline In a five-year mission to be launched in 2003 accuracies of fifteen microseconds of arc over fields of degrees will be reached with this instrument. Another important area of research is the measurement of infrared positions with satellites.

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4. LUNAR OBSERVING

In his presentation the NASA Administrator, D. Goldin, said that lunar optical interferometry to search for planets is his highest priority. Papers were presented on astronomical observations from the Moon including a description of a lunar transit telescope which would utilize a one-meter telescope to provide observations to 28^{th} magnitude. A lunar optical interferometer with ten-kilometer baseline installed in a crater shadow was also described.

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