G51C-08 1205h INVITED

Inner Core Tilt and Polar Motion: Probing the Dynamics Deep Inside the Earth

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A tilted inner core permits exchange of angular momentum between the core and the mantle through gravitational and pressure torques and, as a result, changes in the direction of Earth's axis of rotation with respect to the mantle. Some of the observed variations in the direction of Earth's rotation could then be caused by equatorial torques on the inner core which tilt the latter out of its alignment with the mantle. In this work, we investigate whether such a scenario could explain the decade polar motion known as the Markowitz wobble. We show that a decade polar motion of the same amplitude as the observed Markowitz wobble requires a torque of 10^{20} N m which tilts the inner core by 0.07 degrees. This result critically depends on the viscosity of the inner core; for a viscosity less than 5×10^{17} Pa s, larger torques are required. A torque of 10^{20} N m with decadal periodicity can perhaps be produced by electromagnetic coupling between the inner core and a component of the flow in the outer core known as torsional oscillations, provided that the radial magnetic field at the inner core boundary is on the order of 3 to 4 mT and satisfies certain geometrical constraints. The resulting polar motion thus produced is eccentric and polarized, in agreement with the observations. Our model suggests that equatorial torques at the inner core boundary might also excite the Chandler wobble, provided shorter wavelength torsional oscillations with higher natural frequencies have enough power or provided there exists another physical mechanism that can generate a large torque at a 14 month period.

G52A MCC: Level 1 Friday 1330h

High-Rate GPS: Infrastructure and Applications Posters *(joint with S)*

Presiding: **M Caissy,** NRCAN**; G Weber,** BKG

G52A-0037 1330h POSTER

High-Rate GPS Data From the National CORS Network

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The U. S. National Continuously Operating Reference Station (CORS) network contains 100+ stations that collect GPS data at a 1-hertz rate. Organizations that operate these high-rate CORS include the Federal Aviation Administration (FAA) and the States of Florida, Michigan, North Carolina, Ohio, Pennsylvania, and Vermont, as well as other organizations. The FAA-operated CORS comprise the Wide Area Augmentation System that serves primarily to enable safe and efficient air navigation. The remaining high-rate CORS serve primarily to enable highly accurate static and kinematic positioning, especially for postmission surveying and mapping applications. NOAA's National Geodetic Survey currently distributes GPS data from these high-rate CORS with a 1-hour latency. A significantly shorter latency is technically possible for many of these CORS.

URL: http://www.ngs.noaa.gov/CORS/

G52A-0038 1330h POSTER

A multipurpose high-rate GPS observatory for northwestern Mexico

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We describe a proposed joint atmospheric and geophysical high-rate GPS observatory in northwestern Mexico complementing and extending analogous networks in the United Stated. The observatory would measure atmospheric water vapor during the North American Monsoon Experiment (NAME) as well as crustal velocities within and across the Gulf of California and the Mexican Basin and Range region for geodetic applications. The NOAA-sponsored NAME scheduled for several summers beginning in 2004 addresses the challenging issue of determining and improving the predictability of warm season precipitation in the mountainous region of the Northwestern Mexico and Southwestern US. Much of the rainfall in the region comes during the North American Monsoon each summer. Rainfall in the region is particularly difficult to model and predict because the orography and the complex land-sea geometry of the region with moisture sources in the Gulf of Mexico, Gulf of California and the eastern subtropical Pacific Ocean. The GPS provides accurate, near-continuous observations of water vapor in clear and cloudy air needed to sample the large diurnal variations in the dynamic and thermodynamic properties of the atmosphere. GPS in combination with wind and other measurements scattered in and around the region will provide much needed constraints to determine quantitatively the sources supplying moisture for precipitation within the NAME area. Tectonic applications of this continuous GPS network in Mexico include high-precision determinations of plate boundary deformation in and around the Gulf of California and possible diffuse deformation within the Mexican Basin and Range province. Because of the high sampling rate (1 Hz), the network will also provide data for seismological applications, including surface wave studies (e.g., Larson et al., SCIENCE, 2003) and potential near-field displacement records. Furthermore the network would complement the US-based Plate Boundary Observatory (PBO) facility by extending continuous GPS coverage into northern Mexico and other relatively smaller-scale continuous GPS networks in southern Mexico as well as provide important data for surveying and mapping applications. Several years of observations are required to capture the substantial year-to-year variations in the monsoon and yield accurate estimates of tectonic motion. Both objectives can be accomplished relatively inexpensively with the simple and robust GPS observations made in collaboration with investigators in Mexico.

G52A-0039 1330h POSTER

NTRIP: Networked Transport of RTCM via Internet Protocol - Internet Radio Technology for Real-Time GNSS Purposes

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The massive worldwide growing of Internet capacity enables the introduction of new services such as Internet Radio or Internet Video-on-Demand, which transfer continuous data-streams by IP-packages. These services include the data transport via mobile IP-Networks like GSM, GPRS, EDGE, and UMTS where costs are nowadays rapidly decreasing. As a consequence, the global Internet can be used for the real-time collection and exchange of GNSS data, as well as for broadcasting derived differential products. Compared to Multimedia applications, the bandwidth required for streaming GNSS data is relatively small. The introduction of a real time streaming of GNSS data via Internet as a professional service is demanding with respect to network transparency, network security, program stability, access control, remote administration, scalability and client simplicity. This paper will discuss several possible technical/protocol solutions for streaming GNSS date over the Internet: Unicast vs. IP-Multicast, TCP vs. UDP, Client/Server vs. Client/Server/Splitter architecture. Based on this discussion, a novel HTTP-based technique for streaming GNSS data to mobile clients over the Internet is introduced. It allows simultaneous access of a large number of PDAs, Laptops, or GNSS receivers to a broadcasting host via Mobile IP-Networks. The technique establishes a format called "Networked Transport of RTCM via Internet Protocol" (NTRIP). NTRIP is designed for disseminating differential correction data (e.g. in the RTCM-104 format) or other kinds of GNSS streaming data.

G52A-0040 1330h POSTER

Large Scale GPS Processing at ESOC for LEO, GNSS and Real-Time Applications

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Most POD systems that are used in GPS data analysis, for instance in routine IGS processing, are large FORTRAN programs that have evolved from early generation systems over many years of use. These systems do not exploit the advantages of modern software engineering technology, and their limited processing efficiency constrains their application to emerging large-scale GPS processes, like real-time GPS, high-rate data processing or combined solutions for LEO + MEO constellations. In support of such high-performance applications, the ESOC IGS Analysis Centre is developing a new POD system based on the latest software engineering methods. This system is optimised in its use of both CPU and memory, following fundamental rules of minimum information containment that are more commonly found in internet search engines or artificial intelligence applications. Although this new system still has an experimental status it is expected to augment the GPS data processing capacity at ESOC by at least one order of magnitude. Some innovative concepts behind the system will be presented, together with first examples of GPS processes that until now were prohibitively large or slow.

G52B MCC: Level 1 Friday 1330h

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Signal Versus Noise in GPS Height Time Series II Posters

Presiding: **T van Dam,** European Center for Geodynamics and Seismology**; G Blewitt,** Nevada Bureau of Mines and Geology and Seismological Laboratory

G52B-0041 1330h POSTER

GPS observations of Ocean Tide Loading in the British Isles

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Model predictions show that ocean tide loading (OTL) in the British Isles is particularly large (up to several cms in the S. W. of Britain). The primary cause of uncertainty in OTL models is the ocean tide models on which they depend. Interaction of the tides in the open oceans and the more restricted coastal regions, along with the intricate shape of the coastline, make accurate modelling of OTL in the British Isles difficult. Therefore an approach to directly measure these effects has been devised, using data gathered from a network of continuously operating GPS receivers (COGRs), in an attempt to validate or improve existing OTL models. We observe OTL at diurnal and semi-diurnal periods by directly estimating fixed-period harmonic motions within individual daily GIPSY/OASIS II GPS analyses. This approach enables us to solve separately for the tropospheric zenith wet delay (ZWD) as a random-walk parameter. An iterative Kalman Filter approach to combine the multiple daily solutions enables us to isolate the principal near-diurnal (K_1, O_1, P_1, Q_1) and near-semi-diurnal (M_2, S_2, N_2, K_2) OTL components. A preliminary test shows that data from six UK sites produce estimates which are in good agreement with OTL predicted by the FES99 model, where values vary from 3-43 mm in amplitude (M_2) at the six sites. Our final estimates are generated using approximately 1000 days of data in the solution, resulting in amplitude standard deviations of approximately 1 mm per component (compared with an RMS difference between OTL models of 2 mm per component). However, the phase estimates of the OTL components take much longer to