6 degrees dipping Shahdad thrust occurred 8 to 30 km to the east of the 14 March 1998 Fandoqa earthquake (M_w = 6.6) that involved about 2 m of oblique slip on a steeply dipping fault. That earthquake transferred stress to the Shahdad fault, probably triggering slip on it either immediately or in the following six months. We use nonlinear inversion of the interferograms with the Okada elastic half-space approximation to determine the slip geometry and magnitude of both the Fandoqa and Shahdad ruptures. Further elastic calculations show Coulomb stress change due to the Fandoqa rupture was positive in exactly the area of the Shahdad thrust that slipped. The material above the Shahdad thrust is likely to have a very low strength, and there are hints of plastic behavior. The anomalous slip-to-length ratio for the slip on the Shahdad thrust suggests a mechanism unlike most earthquakes, likely aseismic.

* Work partially performed under contract with the National Aeronautics and Space Administration.

Centre for Observation and Modelling of Earthquakes and Tectonics

G62A-08 1535h

Ross Tide Modeling Using INSAR and Radar Altimetry

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Ocean tides play a significant role in the complex interactions between the atmosphere, ocean, sea ice and floating glacial ice shelves. Tidal currents create turbulent mixing at the bottom of the ice shelf contributing to the creation of rifts for the possible detachment of part of the ice bergs and can influence heat transport between the ice shelf and sea water. Tides near and under floating ice shelves and sea ice, and depending on surface and basal slopes, grounding line migrates with time within a grounding zone. Improved knowledge of the grounding line is inherently necessary to study ice mass balance and its contribution to the global sea level change. Even with the availability of most recent suite of global tide models based primarily on TOPEX/POSEIDON data, e.g., GOT00, NAO99, Delft, FES00, extreme southern ocean tides (-60 deg. latitude South pole-ward) are limited both in accuracy and resolutions, especially in regions near Antarctica, seasonally or permanently sea-ice-covered oceans. InSAR tidal deformation analysis using ERS-1/-2 tandem missions over Ross Sea and in a test region over the Sulzberger Ice Shelf, Ross Sea (-77.50 latitude, 1500 East Longitude) will be presented. In our initial study with the objectives to improve tides in Antarctica oceans for accurate prediction of ground-line locations to enhance ice mass balance studies, we provide an assessment of accuracy of tide models in the region. In addition to global models, finer resolution regional models in the Antarctica Ocean such as the Padman model are available. Coarse resolution tide models using (-50 deg latitude South pole-ward) using available over-ocean and over sea ice and ice-shelf data from ERS-1 and ERS-2, and GFO, will be presented. A fine-resolution test ocean tide model using combined radar altimeter and ERS tandem mission InSAR data over the Sulzberger Ice Shelf is described.

G62B MCC: 133 Saturday 1600h

Bowie Lecture *(joint with S, T)*

Presiding: **J T Freymueller,** University of Alaska, Fairbanks**; V M Dehant,** Royal Observatory of Belgium

G62B-01 1615h INVITED

Towards Imaging the Earth's Surface in 4 Dimensions

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In the seventies, the first generation of Landsat images allowed scientists to map active faults over continents and in some cases to determine direction of motion. In the eighties, 10m-resolution SPOT satellite images provided the means to measure lateral offsets of geomorphic features along faults, helping to determine long-term rates of slip on faults. In the nineties, spaceborne synthetic aperture radar (SAR) systems and advances in the technique of radar interferometry (InSAR) brought spatially continuous observations of the Earth's surface displacement field at the sub-cm level over broad areas, opening a new era in geodesy from space. Totally new insights into earthquakes, volcanic activity, ice flow, and human-induced ground subsidence are resulting. For seismology and tectonics, InSAR data have been invaluable to characterize specific sub-surface processes including poroelastic rebound, after-slip, and visco-elastic relaxation after large earthquakes, characterization of the depth distribution of fault creep along the Hayward fault and the southern section of the San Andreas fault, nonlinear elasticity of the crust from the surface displacement field of the M7.6, Tibet, 1997 earthquake, triggered creep on adjacent faults after the 1999 Hector Mine, California earthquake, and 8 years of transient creep along the Blackwater fault in the Eastern California Shear Zone. In the Los Angeles area, joint analysis of spatially continuous InSAR data and temporally continuous GPS data allows characterization of processes occurring at various temporal and spatial scales. In particular allowing discrimination between seasonal subsidence above acquifers, oil field subsidence, and long-term tectonic strain accumulation along faults and folds. These major advances in Earth science have been demonstrated only in a few areas using the data from the European ERS satellites and the Japanese JERS satellite, both of which were designed for purposes other than InSAR. A dedicated mission, designed specifically for interferometry, would greatly expand applications of InSAR with improved coherence over vegetated areas, better orbit control and determination, frequent revisit time, and multi-look direction. Such a system is an integral part of Earthscope and will open space geodesy to the continuous surveillance of the Earth's surface, globally, and in 3 dimensions.

G71A MCC: Hall C Sunday 0830h

Crustal Deformation I Posters *(joint with S, T)*

Presiding: **J N Kellogg,** University of South Carolina**; S Hreinsdóttir,** University of Alaska, Fairbanks

G71A-0939 0830h POSTER

The Central Apennine Geodetic Network (CAGeoNet): Description and Preliminary Results

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During the time span 1999-2001 we set up and surveyed the CA-GeoNet (Central Apennine Geodetic Network), a dense sub-regional GPS network located in one of the highest seismic areas of the Apennines (Italy), with the aim to detect the active strain rate of this sector of the chain, during inter-seismic and co-seismic epochs. The network extends across southern Umbria (Norcia area), Abrutii and southern Latium (Sora area) regions and from the Tyrrhenian to the Adriatic sea, in an area of about 130 km x 180 km. It consists of 129 vertices distributed with an average grid of 5 km over the main seismogenetic and geological structures of the area. The non permanent network is linked with the ASI and INGV permanent GPS stations. Among them, INGR, VVLO, ROSE and AQU are deployed E-W in this area, allowing a high precision estimation of the current strain rate component normal to the chain, from Tyrrhenian to Adriatic. Site selection and monumentation were performed after an accurate geological study of the area, with the aim to set up group of stations across the typical basin and ranges seismogenetic structures of the central Apennines, to estimate the strain rate in the near field. To obtain the best accuracy during surveys, the monuments were located on significant outcrops using steel markers screwed in the rock (3D monument) or concrete pillars with deep foundations. Data analysis performed by means of Bernese 4.2 and Gamit software, show accuracy within 1?2 mm in the planar and 1?5 mm in the vertical components, respectively. A preliminary comparison between 1999 and 2001 data for the Rieti and Leonessa sub-network shows horizontal displacements ranging from 5 to 15 mm.

URL: http://www.ingv.it

G71A-0940 0830h POSTER

The GIS of the Central Apennines Geodetic Network (CA-GeoNet): Database Description and Application for Crustal Deformation Analysis

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During the last few years we set up and surveyed a GPS geodetic network to investigate the active tectonic areas of the Central Apennine, using a combination of permanent and not-permanent geodetic stations. The final goal is to evaluate the geodetic strain rate and the coseismic deformations of this seismically active area. For an optimal management and mapping of the CA-GeoNet (Central Apennine Geodetic Network) a Geographical Information System (GIS) has been developed. The GIS is used to analyze geodetic sources and improve the analysis of crustal deformations and has been realized on PC platform using MapInfo 6.0 and ArcGIS8.1 software. The GIS manages an SQL database consisting of different classes (Geodesy, Topography, Geography, Seismicity and Geology) administrated according to Thematic Layers. A GIS is required for the multidisciplinary approach and management of large multi-scaled data set, geographically referenced and with continuos or discrete coverage; it is particularly designed to analyze GPS sources and to improve crustal deformation analysis related with tectonic structures and seismicity. Through GIS we can display site displacements, strain rate maps and create new layers gained by numerical and spatial analysis. A tailor-made application to support co-seismic deformation scenarios related with historical and instrumental earthquakes and seismic sources, has been created. Our procedures can be successfully applied to design new geodetic networks in seismically active areas with respect to the known seismotectonic features. This dynamic approach in planning and managing GPS networks for geodynamic applications provides a useful tool for geophysical research, earthquake impact and civil protection management.

URL: http://www.ingv.it

G71A-0941 0830h POSTER

New Constraints Into the Present day Kinematics of the African/Eurasian Plate Boundary System From the Analysis of Permanent and Non-Permanent GPS Data

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The Mediterranean area is presently characterized by a relatively high number of crustal wedges behaving independently or partially independently with respect to one another, as consequences of a complex space and time evolution of the African/Eurasian plate boundary system. This work concerns the analysis of continuous and non-continuous GPS data collected in the