Geofizički odsjek

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O B A V I J E S T

Dana **23.2.2011.** u **13^{15}** održat će se u okviru seminara i kolokvija na Geofizičkom odsjeku PMF-a sljedeće izlaganje:

Prof. John Weber, Ph.D.

(Grand Valley State University, Allendale, MI 49401 USA):

Interdisciplinary studies in neotectonics: Trinidad/Tobago, Caribbean-South American plate boundary zone, and Adriatic microplate (preliminary)

ABSTRACT: The relative motion between the Caribbean and South American plates and kinematics of deforming zone between them remained an unsolved geologic puzzle into the late 1990s. In 2001, we used GPS data from eight sites on the Caribbean plate and five sites on the South American plate to derive an angular velocity vector describing present-day relative plate motion. The Caribbean plate moves approximately due east relative to South America at a rate of ~20 mm/yr along most of the plate boundary, significantly faster than the NUVEL-1A model prediction, but with similar azimuth. Pure strike-slip is concentrated along the approximately east-striking, seismic, El Pilar fault in Venezuela. To measure motions in Trinidad we estimated horizontal velocities at 25 sites first surveyed in a 1901–1903 British Ordnance Survey triangulation and then resurveyed with GPS in 1994–1995. We identify Trinidad's principal active on-land faults, quantify fault-slip-rates, and test for elastic locking. Our best-fit single-fault elastic dislocation model put 12±3 mm/yr of dextral strike-slip on the Central Range Fault (1–2 km locking depth), an apparently locked, aseismic active fault. Repeat GPS measurements made between 1994 and 2005 at two sites spanning Trinidad north to south showed a 14±3 mm/yr eastward (plate-motion-parallel) dextral velocity differential, consistent with our best-fit historic (1901–1995) fault-slip-rate. The existing 1901–1995 and 1994–2005 geodetic data alone cannot resolve whether the Central Range Fault is essentially creeping (1–2 km locking depth) or locked to a more standard depth of 10 km. Paleoseismology trenching, however, show that the Central Range Fault cuts <5000-year-old sediment and is capped by ~550-year-old sediment, suggesting that it may be locked and may have ruptured at least once during this time interval. In the talk, I will also cover recognition and analysis of broad-scale tectonic geomorphic features that support that the Venezuelan El Pilar Fault steps southward across an active pull-apart basin in the Gulf of Paria to the Central Range Fault in Trinidad.

The ocean-continent boundary between the Tobago terrane and continental South America was the site of the largest (M 6.6) recorded earthquake in the Trinidad-Tobago segment of the plate boundary zone. During this event (April 22, 1997) an ~E-W striking (250° azimuth), shallowly dipping (30°) dextral- normal fault ruptured the seafloor ~10 km south of Tobago. We also studied this earthquake and its associated seismic sequence, GPS-determined coseismic offsets, fault plane and fault slip geometry, and the reactivation neotectonics related

to this event. The event is anomalous and of interest because of its large normal-slip component and ~E-W strike is unexpected given the current ~E-W dextral shearing in the plate boundary, because it ruptured a normal fault plane with an extremely low (30°) dip angle, and because it reactivated the Tobago terrane -South American continent (former thrust) boundary.
On-going research describing the motion of the Adriatic microplate and deformation in the Adriatic-Eurasian plate boundary zone will also be introduced. We studied the motion of the Adriatic microplate using Eurasian-referenced GPS-derived velocities from Istria Peninsula (Slovenia, Croatia) and Po Plain (Italy) sites and earthquake slip vectors around its edges from a Regional Centroid Moment Tensor catalogue. Our best-fitting GPS Adria–Eurasia angular velocity vector (Euler pole) comes from 7 Istria Peninsula (Slovenia, Croatia) and 10 Po Plain (Italy) sites; it locates at 45.03°N, 6.52°E, with a 0.297±0.116°/Myr counterclockwise rotation rate. An Adriatic microplate interpretation is at odds with Neogene geologic features that indicate recent convergence across the Apennines and Alps. The neotectonics–geology mismatch probably signals the recent birth of the Adria microplate upon termination of the Nubia–Eurasia Alpine collison and Adria slab break-off beneath the Apennines. Our PIVO GPS results from ~50 episodic stations in Slovenia and surroundings resolve ~2 mm/yr of ~N-S shortening in the Adriatic-Eurasian plate boundary zone, which we are currently analyzing and modeling.

Pozivaju se studenti, apsolventi i svi zainteresirani da prisustvuju predavanju, koje će se održati u predavaoni br. 2 Geofizičkog odsjeka PMF-a, Horvatovac 95, Zagreb. Studentima 2. godine diplomskog sveučilišnog studija fizika - geofizika je prisustvovanje predavanjima u sklopu Geofizičkog seminara obavezno.