Evidence from GPS Data for an Eastern Bird's Head Block in Indonesia

Anahita Tikku » Dept of Earth & Environmental Sciences, Rensselaer Polytechnic Institute
Cecep Subarya » National Coordinating Agency for Surveys and Mapping, Cibinong, Indonesia
Masturyono » Meteorology and Geophysics Institute, Jakarta, Indonesia
Rob McCaffrey » Dept of Earth & Environmental Sciences, Rensselaer Polytechnic Institute
Jeff Genrich » Geological & Planetary Sciences, California Institute of Technology

Our GPS solutions from campaign data collected between 1992 and 2005 suggest that what was previously recognized as one microplate between the Pacific and Australian plates, the Bird's Head Block in eastern Indonesia, is actually composed of two distinct blocks. The newly identified Eastern Bird's Head Block is a triangular region at least 400,000 km^2 constituting the Cenderwasih Bay south of the Yapen fault. The GPS solutions indicate the Eastern Bird's Head Block accommodates shear between the Bird's Head Block and Australian plate in New Guinea as opposed to a broad distributed shear zone. Between 2002 and 2005 there were four earthquakes with magnitudes greater than Mw=7.0 in the Bird's Head Region. Though they disrupted the GPS time series used to establish the steady plate motion of the Bird's Head Block, the earthquakes and their aftershocks provide valuable tectonic information by identifying the slip on the faults bounding the newly identified block, which is consistent with the predicted activity on the faults from the Euler poles for the Eastern Bird's Head Block. We also see large co-seismic displacements and estimate seismic moment from GPS data for the Mw=7.5 earthquake which occurred on 10 October 2002 in the Wandamen fault zone, coincident with the western boundary of the Eastern Bird's Head Block. Overall our results are significant because they provide further support for block motion rather than distributed deformation in accommodating relative plate motions.

References

Tikku, A.A., C. Subarya, Masturyono, R. McCaffrey and J.F. Genrich, Evidence from GPS data for an Eastern Bird's Head Block in Indonesia, in preparation for submission to JGR-Solid Earth.

Figure 1. Horizontal velocities in the Bird's Head region with respect to Australia [AUS] and definition of the Bird's Head [BHED] and Eastern Bird's Head Block [EBHED]. The stations annotated in red present GPS solutions subsequent to the October 2002 earthquake, those annotated in green present solutions that include all data (1992-2005). Note that not all the stations were occupied each campaign. The blue vectors present the modeled BHED-AUS relative plate motion; the magenta vectors present the modeled EBHED-AUS plate motion.