EOS
EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION

VOLUME 91 NUMBER 20
18 MAY 2010
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Database of Active Structures From the Indo-Asian Collision

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The ongoing collision of India and Asia has produced a vast system of folds and faults, many of which are active today, as evidenced by such recent deadly earthquakes as the 12 May 2008 Sichuan quake [*Parsons et al.,* 2008]. Understanding these events requires knowledge of the region's geologic structures.

Taylor and Yin [2009] have assembled HimaTibetMap-1.0, a multiformat, comprehensive database of first-order active structures in central Asia that may aid researchers, educators, and students in their studies of Indo-Asian tectonics. For example, this database may be used by seismologists, geodesists, and modelers to identify structures in particular locations that contribute to active deformation, or it may be used by teachers to illustrate concepts such as continental collision or distributed deformation of continents.

HimaTibetMap-1.0 is publicly available through the University of Kansas's (KU) Hawk Drive, a "Web 2.0"-style Web site that allows for the addition of user-generated content and comments. This site (https://documents.ku.edu:443/collaboration/Geologic Data in Tibet) is intended as a repository where geologists may contribute their own work for use by the community and as a forum for informal discussions about Indo-Asian neotectonics.

HimaTibetMap-1.0

The database contains more than 900 active structures, taken from the academic journals, remote sensing interpretations, and other information (e.g., seismic focal mechanisms). Additionally, the database includes the main suture zones in the Himalayan-Tibetan orogen and the distribution of Cenozoic (65 million years ago to present) volcanism in Tibet. The precision of fault locations is suitable for regional-scale plotting, but it may be useful for browsing at smaller scales.

HimaTibetMap-1.0 is available in several formats. Geographic information system users likely will be interested in the ESRI ArcMap version. An ASCII format for use with the open-source software Generic Mapping Tools (GMT) [*Wessel and Smith*, 1998] may be particularly useful to geophysicists and geodesists (Figure 1). A Google Earth™ Keyhole Markup Language (KML) version allows for easy browsing at all scales and could be a great tool for use in education (Figure 2). The ArcMap version contains a fault's source and kinematics included as attributes, while the other versions are sorted by their kinematics. A README file accompanying all formats contains information about data plotting and sources and methods used in the database compilation.

Hawk Drive

The database is intended as a starting point for a collaborative compilation of Indo-Asian neotectonic data. KU's Hawk Drive is an installment of the Xythos Internet-based collaboration software. Within Hawk Drive, the "Geologic Data in Tibet" Web page is a wiki containing public access content (e.g., HimaTibetMap-1.0). However, the Web page also has more functionality for registered users, who may upload data or modifications of extant data and comment on message boards about the data or Indo-Asian tectonics. New data or modifications may be added with a user's choice of software, but it is his or her responsibility to provide data in a format useful to the community. Although contributors must be added manually, permission will be granted on request. Contributions will be posted separately from the current version of the database but may be incorporated in future versions, with the contributor's approval; therefore, contributions will not initially be vetted. Users who upload materials will retain full rights to those materials and may control access. For registration or more information, contact Richard Styron.

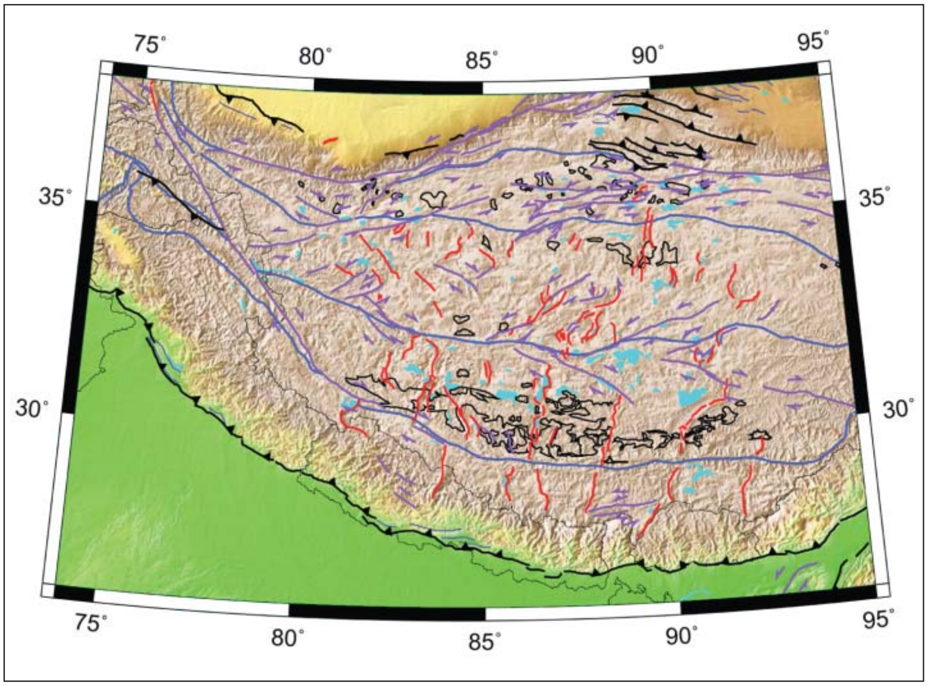

Fig. 1. Generic Mapping Tools (GMT) map of Tibet incorporating HimaTibetMap-1.0 data. Purple lines indicate strike-slip faults. Red lines indicate normal faults. Bold black lines indicate thrust faults. Thinner black lines indicate the distribution of Tibetan Cenozoic volcanism. Bold blue lines indicate sutures. Thin blue lines indicate folds.

References

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Taylor, M., and A. Yin (2009), Active structures of the Himalayan-Tibetan orogen and their relationships to earthquake distribution, contemporary strain field, and Cenozoic volcanism, *Geosphere*, *5*(3), 199–214, doi:10.1130/GES00217.1.
Wessel, P., and W. H. F. Smith (1998), New, improved version of Generic Mapping Tools released, *Eos Trans. AGU*, *79*(47), 579.

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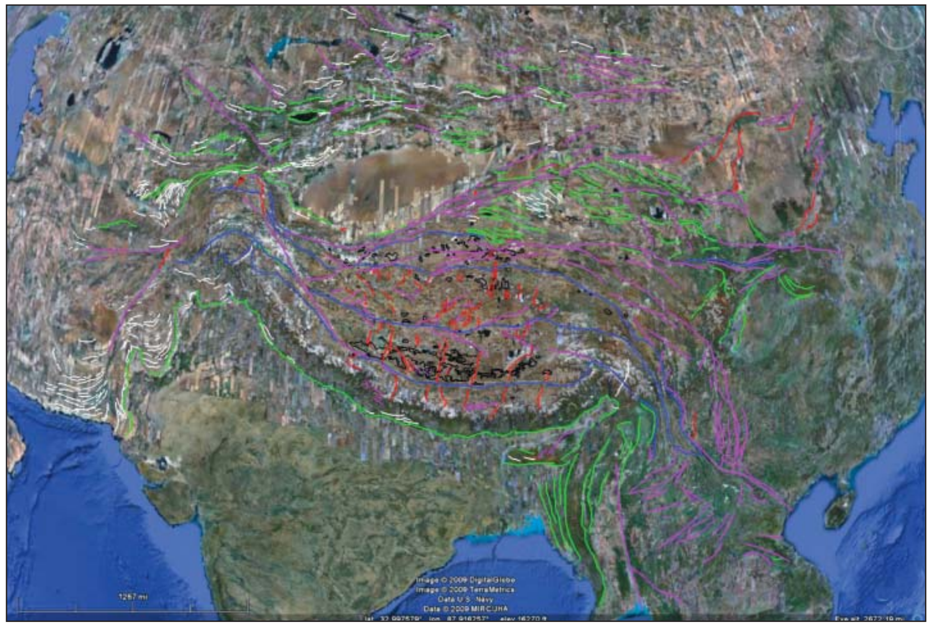

Fig. 2. HimaTibetMap-1.0 data in Google Earth™. Color scheme is the same as Figure 1 except white lines indicate folds and green lines indicate thrusts.

Ocean Observing System Demonstrated in Alaska

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To demonstrate the utility of an ocean observing and forecasting system with diverse practical applications—such as search and rescue, oil spill response (perhaps relevent to the current Gulf of Mexico oil spill), fisheries, and risk management—a unique field experiment was conducted in Prince William Sound, Alaska, in July and August 2009. The objective was to quantitatively evaluate the performance of numerical models developed for the sound with an array of fixed and mobile observation platforms (Figure 1).

Prince William Sound was chosen for the demonstration because of historical efforts to monitor ocean circulation following the 1989 oil spill from the *Exxon Valdez* tanker. The sound, a highly crenulated embayment of about 10,000 square kilometers at approximately 60°N latitude along the northern coast of the Gulf of Alaska, includes about 6900 kilometers of shoreline, numerous islands and fjords, and an extensive system of tidewater glaciers descending from the highest coastal mountain range in North America. Hinchinbrook Entrance and Montague Strait are the two main deep water connections with the Gulf of Alaska. The economic base of communities in the region is almost entirely resource-dependent. For example, Cordova's economy is based on commercial fishing and Valdez's economy is supported primarily by the trans-Alaska oil pipeline terminal.

When the *Exxon Valdez* ran aground on Bligh Reef in the northeast corner of the sound, the resulting oil spill followed a southwesterly trajectory, with much of the oil stranding on island beaches before exiting the sound through Montague Strait. Since the incident, numerous studies conducted on oil spill–related impacts and ecological recovery have led to the development of a prototype ocean observing and forecasting system focusing on oil spill trajectories.

Developing Operational Forecast Models

In 2003 the observing system included periodic hydrographic surveys, coastal weather stations, a high-frequency (HF) radar array imaging the central basin, a 4-kilometer-grid regional atmospheric

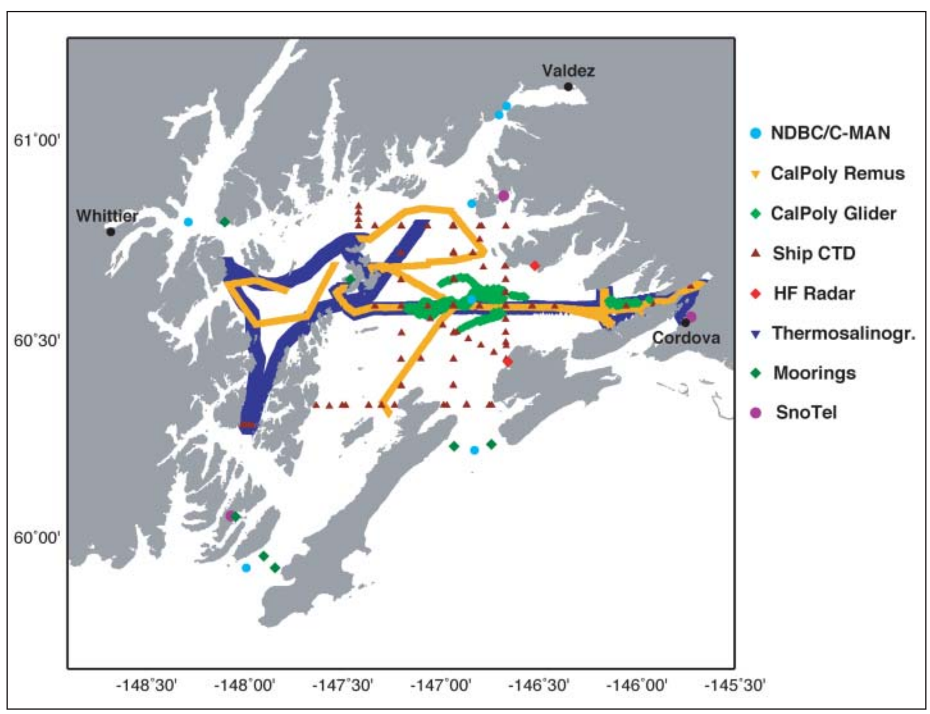

Fig. 1. Observational sensors, platforms, and surveys in Prince William Sound. NDBC/C-MAN is National Buoy Data Center Coastal-Marine Automated Network; CalPoly is California Polytechnic State University; CTD is Conductivity, Temperature, Depth; HF is High-Frequency; SnoTel is Snowpack Telemetry.