MASE: Shallow Subduction in Central Mexico

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ABSTRACT

The objective of the MASE (Middle America Subduction Experiment) is to construct a geodynamical model of the subduction process. The Middle America Trench was chosen as the first example because of the relatively simple plate geometry (a linear margin with near normal subduction) and a significant along-strike slab-tip variation. The initial deployment along the Acapulco to Tampico transect in central Mexico is designed to investigate the case of shallow subduction.

The main results to date are:
- The discovery that the slab underplates the continental crust to a distance of 200 km from the trench. This result is interesting because there is no geologic or geodetic indication of coupling in this zone – the coupling that is measured geodetically is confined to the initial 75 km near the coast where the slab is dipping down. There is also no fluid signature in the magnetotelluric (MT) data of the flat-slab portion of the line.
- The relative attenuation in the mantle under the Mexican Volcanic Belt (presumed location of the mantle wedge) is a factor of 2 higher than the surrounding mantle.
- Modeling studies indicates that a shrinking low-viscosity mantle wedge can lead to flat slab subduction as observed.
- A slow earthquake appears to be in progress on the southern 200 km of the MASE line. The last slow event occurred in 2002. This one started in March, 2006.

CURRENT MASE SEISMIC ARRAY

RECEIVER FUNCTION STUDY

MAGNETOTELLURICS STUDY

Electrical Resistance

Dehydration from the slab

Serpentinization of the incoming slab

Previous episodes of dehydration

ATTENUATION STUDY

SURFACE WAVE STUDY

GPS STUDY

Simulation of Flat Slab Subduction

Proposed Oaxaca Line

The pictures show engineering students from UNAM making presentations on earth science and earthquake hazard at a school that is hosting a MASE student.