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# Central American Subduction System

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## G E O P H Y S I C I S T S

## In Memoriam

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**Robert B. Abel**, 81, 10 October 2007,  
Ocean Sciences, 1985

**Luiz M. Barreto**, 71, 11 April 2006,  
Geomagnetism and Paleomagnetism, 1989

**Lester Tomlinson**, 63, 2 December 2006,  
Geomagnetism and Paleomagnetism, 1990

## Honors

**Walter J. Arabasz**, director of the Uni-  
versity of Utah Seismograph Stations and

research professor of geophysics at the uni-  
versity, has received the John Wesley Powell  
Award from the U.S. Geological Survey (USGS)  
for his outstanding scientific leadership in  
helping the public and elected officials  
understand and reduce the impact of earth-  
quakes. The award—named for the scientist  
and explorer who served as the second  
USGS director—recognizes an individual or  
group, not employed by the federal govern-  
ment, whose contributions to the USGS's  
objectives and mission are noteworthy.

**Joern Thiede**, director of the Alfred  
Wegener Institute for Polar and Marine  
Research in Bremerhaven, Germany, and  
past president of the Scientific Committee  
on Antarctic Research, was presented with  
the Georg von Neumayer Medal "for out-  
standing and deserving achievements in the

field of polar research" by Margit Conrad,  
state minister for environment in Bad  
Dürkheim, Germany.

**Robert Woodward** has been appointed  
USArray Director for the **Incorporated  
Research Institutions for Seismology**  
(IRIS), with responsibility for overall coor-  
dination of USArray activities as part of  
EarthScope. Previously, Woodward was  
with Science Applications International  
Corporation (SAIC), where he managed  
geophysical research and development  
projects.

## M E E T I N G S

## Central American Subduction System

*Workshop to Integrate Subduction Factory and Seismogenic Zone Studies  
in Central America,  
Heredia, Costa Rica, 18–22 June 2007*

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The driving force for great earthquakes and  
the cycling of water and climate-influencing  
volatiles (carbon dioxide, sulfur, halogens)  
across the convergent margin of Central Amer-  
ica have been a focus of international efforts  
for over 8 years, as part of the MARGINS pro-  
gram of the U.S. National Science Foundation,  
the Collaborative Research Center (SFB 574) of  
the German Science Foundation, and the Cen-  
tral American science community. Over 120  
scientists and students from 10 countries met  
in Costa Rica to synthesize this intense effort  
spanning from land to marine geological and  
geophysical studies.

A major topic of discussion at the meeting  
was the location of the seismogenic zone.  
The smectite to illite transformation is no  
longer a viable explanation for the onset of  
seismicity. Instead, laboratory measure-  
ments and theory point to fluid pressure  
and content as critical variables, and detailed  
seismic studies and mapping and sampling  
of fluid vent structures have led to a new  
hydrologic model for the erosional fore arc.  
Additionally, a change from high to low  
heat flow in the crust entering the Costa

Rica trench coincides with a deepening in  
the onset of seismicity, suggesting that the  
shallow limit of earthquake generation is  
temperature-related.

One exciting discovery discussed at the  
meeting has been the recording of pres-  
sure pulses in near-trench boreholes that  
are synchronous with slow earthquakes  
recorded as strain transients on land. How-  
ever, the onset of microseismicity off the  
Nicoya peninsula does not coincide with  
the start of locking at the plate interface as  
revealed by Global Positioning System  
(GPS) measurements, suggesting different  
processes at play. Seismicity is also related  
to incoming bathymetry, with earthquakes  
closely following the subduction of sea-  
mounts and faults. Understanding the  
mechanical coupling between these fea-  
tures in the seismogenic zone is the target  
of plans under way to drill off Costa Rica  
as part of the Integrated Ocean Drilling  
Program (IODP).

The meeting also led to a confluence of  
observations from many disciplines bearing  
on enhanced cycling of volatiles at the Nicara-  
gua margin. The volcanoes of Nicaragua erupt  
magmas with unusually low fraction of oxy-

gen-18 ( $\delta^{18}\text{O}$ ) and high ratios of barium to lan-  
thanum, pointing to an unusual flux from the  
subducting plate. Marine seismic surveys  
show reduced velocities in the area of bend  
faulting in the subducting plate outboard of  
Nicaragua, consistent with up to 10–17% ser-  
pentinization of the uppermost 3–4 kilom-  
eters of the mantle. The serpentinized plate  
may thus provide a major source of water for  
generating arc volcanism. Seismic tomog-  
raphy reveals a low S-velocity region vertically  
beneath the Nicaraguan volcanoes, consis-  
tent with rising water-rich melts. The water  
contents of Nicaragua magmas are among the  
highest in the world. New geochronological  
studies of lavas and tephros throughout Cen-  
tral America have improved estimates for the  
volume flux of erupted material. These flux  
data, combined with volatile data from melt  
inclusions and fumarolic measurements, dem-  
onstrate that water may be balanced across  
the margin to within 80% but that carbon diox-  
ide is not, with as little as 10–30% of the input  
accounted for in volcanic fluxes. Such volatile  
flux estimates have important implications for  
both long- and short-term climate.

Conference participants agreed that  
because so many regions are at great risk,  
continued monitoring is critical to improving  
our understanding of subduction hazards  
in Central America. For further details, see  
[http://www.nsf-margins.org/CostaRica2007/  
index.html](http://www.nsf-margins.org/CostaRica2007/index.html).

—KAJ HOERNLE, IFM-GEOMAR at the Christian-  
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GUILLERMO ALVARADO, Universidad de Costa  
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PROTTI, Universidad Nacional, Heredia, Costa Rica.