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In North Ecuador – South Colombia margin (0-4°N), the sedimentation rate in the trench and the tectonic deformation co-control the location of the seismogenic zone.

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The North Ecuador - South Colombia convergent margin shows along strike variations in tectonic, thermal and seismogenic features that offer a great opportunity to study the relation between subduction zone tectono-structure, thermal regime and location of the thermally-defined seismogenic zone. Multichannel seismic reflections and conventional bathymetric data were collected in 2000 and 2005 during the SISTEUR and AMADEUS cruises. 6 selected lines perpendicular to the margin were processed with a pre-stack depth migration using a preserved amplitude approach (alias Ray+Born diffraction tomography). The first heat flow measurements in this area were also acquired, completed by heat flow derived from numerous bottom simulating reflectors.
The margin is divided in Esmeraldas, Patia, Tumaco and Manglares segments.
1/ Tectonically, the tectonic deformation at the margin front drastically vary from North to South: The Patia segment is fronted by a 35 km- long active accretionary prism, the Tumaco segment by a less than 10 km-long active accretionary prism, no accretion occur in the Manglares segment, while the southern Esmeraldas segment undergoes a strong tectonic erosion. It is noteworthy that this regime is independent from the sediment thickness in the trench which is thinner where the prism is longer.
2/ Thermally, these segments also shows clear variations in heat flow that is, in the trench and in the lower slope, two-fold lower in the Tumaco segment than in the others.
3/ Sismogenically, large subduction earthquakes have ruptured the plate interface beneath the Manglares segment in 1958 and the Tumaco-Patia segments en 1979. Based on the aftershocks distribution and the rupture zone location, the seismogenic zone extends trenchward nearby the deformation front in the Patia-Tumaco segments but is restricted 30 km landward in the Manglares segment.

The integrated interpretation of heat flow and sismic data indicate that:
1/ The thermal segmentation is mainly related to the sedimentation rate over the oceanic plate: thick sediment loading in the trench results in low heat flow values inducing a cooling effect along the interplate contact that can shift landward the updip of the seismogenic zone by tens of km.
2/ The tectonic regime by controlling the depth of the decollement also impact its thermal regime. The decollement is much deeper and hotter in accretionnary margins than in non-accretionnary or/and erosional margins. As a consequence, In Ecuador-Colombia, the thermally-defined seismogenic zone extends closer to the trench in accretionnary segments, consistently with the aftershock zone and the rupture zone of great subduction earthquakes.