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How the temperature of the incoming plate influences continental plate tectonics and earhquakes - Preliminary results of the marine TIPTEQ project

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The marine component of the TIPTEQ project studies a key first-order parameter shaping the subduction factory - the thermal structure (i.e. age) of the incoming ocean plate and its effects on continental tectonics during subduction. Within a 10ŕ region along the Chile Trench surrounding the Chile Triple Junction, there exists a unique natural laboratory isolating this process for detailed geophysical investigation. Here fracture zone offsets of the Chile (Nazca-Antarctic) Ridge have created a situation in which neighbouring sections of oceanic lithosphere created along the same spreading center are subducting at ages ranging from 0-30 Ma. There are obvious slab-age-dependent effects on the tectonics and volcanism of the overriding South American plate. Anomalously high regional forearc subsidence (due to tectonic erosion?) strongly correlates with younging ages of the subducting plate - producing up to several kilometers of along-forearc subsidence in the region just north of the subducting ridge. Where the ridge itself is actively subducting, there is a focused pulse of local forearc uplift and subsidence. Furthermore, a gap in arc magmatism exists just to the south of the region of active ridge subduction, in the region between 47ŕ-49ŕS where subducted slab of age $<\tilde{}$10 Ma is underlying the 'normal location' for arc magmatism. This ˜900-km-long region of southwards increasing regional forearc subsidence is also the site of the 1960 Great Chile Earthquake, the world's largest recorded earthquake, during which more than 800 km of plate boundary rupture occurred. While all of these effects are obviously correlated with the thermal structure of the subducting slab, the physical origin of these effects is still unknown, in large part because we know almost nothing about how variations in plate-age have affected the incoming plate and forearc. In particular, we still know almost nothing about the along-strike changes in the

physical and chemical structure, the heat flux, or even the dip, of the subducting slab. We present the preliminary results of a 3 months survey in the area with R/V SONNE in winter 2004-2005.