



Tectonics at the edge of the Andes: The Chile Convergent Margin

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The more than 3500 km long Chile subduction zone provides an exceptional setting for studying governing tectonic processes at convergent margins at single plate boundaries. The Chile trench is segmented by the subduction of the active spreading center of the Chile Rise, and by the Juan Fernández hot spot ridge. A further factor is the intense climatic change from the Atacama Desert in the north to the glacially influenced southern latitudes that cause a remarkable variability in the volume of sediment supplied to the trench.

Multichannel seismic reflection profiles and multibeam bathymetric data show the variability of tectonic processes along the entire convergent margin. Central and south Chile have 50-60 km wide accretionary prisms and thick turbidite trench infill. Where positive topographic relief at the trench inhibits the flow of turbidites, sediment infill decreases to less than 1 km thick. Here, all incoming sediment subducts; the margin is extending by normal faulting and collapsing due to removal of material by basal tectonic erosion. At the end-member northern Chile turbidite-starved trench, ~1 km of slope debris reaches the trench and is afterwards subducted. Along the entire Chile trench, the volume of subducting material possibly varies little. Conversely, its origin ranges from slope debris of upper-plate fragments and material removed from the upper plate in the segments dominated by basal subduction erosion, to turbidites derived from the Andes in the segments dominated by accretion. However, the changes in material properties and fluid content in the subduction channel might be relatively minor. A previously assumed influence of dominant tectonic processes (tectonic erosion vs accretion) on shear coupling along and across the plate boundary are not clearly sup-

ported by observations.