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Late Cenozoic sea level rise from clastic slope sedimentation to barrier reef installation: seismic imaging of upper margin sequences, New Caledonia continental ridge (Southwest Pacific)

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In order to unravel the space and time relationships between (1) onshore erosional lateritic surfaces and fluvial sediments, (2) marine sedimentary sequences and (3) the lagoon – barrier reef system carried by the New Caledonia ridge, seismic lines were acquired from the mid slope of the eastern margin of the ridge (c.a. 1000 m depth) to the coast of mainland New Caledonia across the lagoon and barrier reef (Néomarges cruise, R/V Alis). The lines were located on the basis of detailed seabeam bathymetric data from the upper slope of the margin showing a submerged planation surface of regional extent between 200 and 700 m depth. This surface is underlain by a concordant, well-layered, and reflective sedimentary unit (unit 2) that may attain 0.3 s in thickness. Dredging of this unit reveals a coarse conglomerate characterized by a marine matrix. Unit 2 gets thicker downslope (up to more than 0.8 s thick) and shows a reflection pattern suggestive of channeling disconformities in its lower part. Unit 2 may be concordant with, or truncates a lowermost unit (1) showing strong reflectors. Some seismic lines indicate that unit 2 seals faulted and tilted blocks of unit 1. This, together with earlier deep seismic lines and biostratigraphy of former dredged samples (Ref. 1), indicates that the planation surface is an abandoned sedimentary slope recording a siliciclastic transgressive systems tract, which seals a major episode of extensional faulting that shaped the margin in the Late Miocene at the earliest. The main break in the uppermost slope of the margin coincides with a major sequence boundary at c.a. 150 m depth, which unconformably overlies moderately basinward-

dipping beds of earlier sedimentary units. This surface supports a carbonate ramp (unit 3) recording a transgressive or highstand systems tract, which is interpreted to result from one of the Quaternary interglacial sea level rises (marine isotopic stage 5 or older). The barrier reef stands at the top of the carbonate ramp, and the lagoon appears to seat on the rimmed carbonate platform lying behind the ramp. The lagoon records at least one episode of relative sea-level drop marked by the incision and subsequent partial infill of a fluvial network. Biostratigraphic dating of dredged samples of the imaged sedimentary units will allow constraining the tempo of long-term sea level variations, geomorphic responses to climate change, and the age and history of carbonate platform sedimentation in this key area of the Southwest Pacific.

Ref 1: Daniel, J. et al., 1976. Cah. ORSTOM, Sér. Géol., VIII, 95-105.