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A review on the patterns of river material fluxes, coastal plume dispersal, shelf sediment facies, and anthropogenic impacts of the Tropical Land-Sea Interface, Sergipe/Alagoas, Northeast Brazil

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This study couples published and unpublished information on the alterations of continental material fluxes, plume dispersal patterns and coastal erosion induced by natural and human impacts to the distribution of sediment facies and sedimentation rates of the continental shelf of the States of Sergipe and Alagoas, northeastern Brazil (Lats. 8o56,2' and 11o20,0' S, Longs. 35o07,7' and 37o14,2' W). Historical data on river flow and material fluxes of 7 rivers, including the São Francisco river (L = 2850 km, AB = 634000 km2), were obtained from own measurements and from the national data bank of ANA (National Agency of Waters, www.ana.gov.br) with the softwares HIDRO 1.2 and SisCAH 1.0. Historical data on the distribution of sediments and their elemental composition of the shelf from the AKAROA (1965) campaign with 190 sampling stations (scale 1:1.000.000; Kempf, 1972, Summerhayes et al. 1975 & 1976, Coutinho, 1976) were revisited and new digital maps constructed with ArcGIS 9.3. Comparisons are made from new maps from recent campaigns (scale 1:250.000) performed by the consortium GEORIOEMAR/ UFS/ CENPES/ PETROBRÁS (2010). Statistical analyses with all parameters revealed that the shelf harbors 4 major regional sedimentary domains (i.e. A to D), reflecting the interaction between continental inputs and the impact of the oligotrophic South Equatorial Current (SEC) upon the shelf. The domains are: A- The Alagoas shelf. Set north of the São Francisco river with low fluvial input, dominance of SEC, recent organogenetic carbonate sediments with the calcareous algae Lithothamnium sp. and Halimeda sp. B- The São Francisco river alluvial fan and canyon. The river harbors a cascade of dams and after 1995, river flow declined by 40 % and was modulated to a constant flow of 2060 m3s-1, 95 % of the suspended matter load was retained within the reservoirs and nutrients (N,P) were impoverished by 90 % . The estuarine waters are now transparent and oligotrophic and the coastal plume lost its original turbidity and unimodal seasonal pattern of pulsation upon the shelf as indicated by In Situ sampling and Satellite imagery series (LANDSAT TM 2-5 and MODIS). The coastal plume is largely fed with suspended matter from resupension processes and coastal erosion. C- The Japaratuba river fan. The inner-mid shelf harbors relict muddy and sandy siliclastic sediments and the shelf margin biodetritic carbonates. Riverine inputs have become insignificant. D- The southern shelf of Sergipe. The muddy, sandy and carbonate Merl sediments are heterogeneously distributed,and the coast is affected by diffuse small riverine inputs and wash out by the SEC. Sedimentation rates (210Pbex chronology with the CRS model) of Domains B and C ranged between 0.7 and 0.1 cm year-1, being similar to those of the eastern Brazilian shelf.