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The Exchange Processes in the Patos Lagoon Estuarine Channel, Brazil

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ABSTRACT

Investigation of process controlling the estuarine-shelf interaction in the Patos Lagoon estuarine channel is accessed using a two-dimensional numerical model. Results obtained suggest this approximation provides good precision level to investigate the advective transport of oceanic waters near the estuarine mouth. The introduction of coastal waters in synoptic time scales is dominated by advection in sub-superficial layers. This process results from the competition between flood currents driven by remote wind effects and gravitational circulation controlled by the intensity of the freshwater discharge. The short term exchange processes follow one most energetic cycle of 8 days and intense flood events occur during periods of low continental discharge and higher intensity winds. Very stratified salinity profiles are found during periods of moderated freshwater discharge. The salt transport is inversely related to the freshwater discharge intensity. It presents a mean rate of the 105 kg.day^{-1} transported landward during flood events.

KEYWORDS

Freshwater Discharge, Stratification, Advection, Barotropic Oscillations

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References

[1] B. Knoppers and B. Kjerfve, "Coastal Lagoons of South- Eastern Brazil: Physical and Biogeochemical Characte- ristics," In: G. M. Perillo, M. C. Picollo and M. Pino- Quivira, Eds., Estuaries of South America—Their Dynamics and Geomorphology, Springer Verlag, Heidelberg, 1999, pp. 25-66.

[2] C. Hartmann and C. A. F. Schettini, "Aspectos Hidroló- gicos na Desembocadura da Laguna dos Patos, RS," Revista Brasileira de Geociências, Vol. 21, No. 4, 1991, pp. 371-377.

[3] O. O. M?ller, "Hydrodinamique de La Lagune dos Patos, Mésures et Modelisation," DSc. Thesis, Université Bor- deaux I, Bordeaux, 1996.

[4] O. O. M?ller, J. A. Lorenzzetti, J. L. Stech and M. M. Mata, "The Patos Lagoon Summertime Circulation and Dynamics," Coastal Shelf Research, Vol. 16, No. 3, 1996, pp. 335-351.

[5] O. O. M?ller, P. Castaing, J. C. Salomon and P. Lazure. "The Influence of Local and Non-Local Forcing Effects on the Subtidal Circulation of Patos Lagoon," Estuaries, Vol. 24, No. 2, 2001, pp. 297-311. doi:10.2307/1352953

[6] E. H. L. Fernandes, "Modelling the Hydrodynamics of the Patos Lagoon, Brazil," DSc. Thesis, Institute of Mari- ne Studies Faculty of Science, University of Plymouth, Plymouth, 2001.

[7] E. H. L. Fernandes, K. R. Dyer, O. O. M?ller and L. F. H. Niencheski, "The Patos Lagoon Hydrodynamics during an El Ni?o Event (1998)," Continental Shelf Research, Vol. 22, No. 11-13, 2002, pp. 1699-1713. doi:10.1016/S0278-4343(02)00033-X

[8] E. H. L. Fernandes, K. R. Dyer and O. O. M?ller, "Spatial Gradients in the Flow of Southern Patos

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Lagoon, " Journal of Coastal Research, 2005, Vol. 20, pp. 102-112.

[9] P. C. Abreu, H. W. Granéli and C. Odebrecht, "Produ??o Fitoplanct?nica e Bacteriana na Regi?o da Pluma Estuarina da Lagoa dos Patos—RS, Brasil," Atlantica, Rio Grande, Vol. 17, No. 1, 1995, pp. 35-52.

[10] J. Castello, A. Duarte, O. O. M?ller, F. Niencheski, C. Odebredcht, G. Weiss, R. Habiaga, V. Bellotto, D. Kitz- mann, C. Souto, R. Souza, A. Ciotti, G. Fillmann, P. Schwingell, J. Bersano, M. Cirano, K. Freire, I. Lima, R. Mello, A. Monteiro, C. Resgalla, I. Soares and M. Suzuki. "On the Importance of Coastal and Subantartic Waters for the Shelf Ecosystem off Rio Grande do Sul," Anais do II Simpósio de Estrutura, Fun??o e Manejo de Ecossistemas da Costa Sul e Sudeste, S?o Paulo—Brazil, I. Vol. 71, No. 1, 19

[11] A. M. Ciotti, C. Odebrecht, G. Fillmann and O. O. M?ller, "Freshwater Outflow and Subtropical Convergence Influence on Phytoplankton Biomass on the Southern Brazilian Continental Shelf," Continental Shelf Research, Vol. 15, No. 14, 1995, pp. 1737-1756. doi:10.1016/0278-4343(94) 00091-Z

[12] C. Odebrecht, and V. M. T. Garcia, "Pytoplankton," In: U. Seeliger, C. Odebrecht and J. P. Castello, Eds., Sub- tropical Convergente Environments, the Coast and Sea in the Southwestern Atlantic, Springer-Verlag, Berlin, 1996.

[13] P. Delaney, "Fisiografia e Geologia de Superfície da Planície Costeira do Rio Grande do Sul," Especial da escola de Geologia de Porto Alegre, Vol. 6, 1965, pp. 1-105.

[14] W. C. Marques and O. O. M?ller, "Variabilidade Tem- poral em Longo Período Dadescarga Fluvial e Níveis de água na Lagoa dos Patos, Rio Grande do Sul, Brasil," Revista Brasileira de Recursos Hídricos, Vol. 13, No. 3, 2008.

[15] W. C. Marques, "Padr?es de Variabilidade Temporal nas For?antes da Circula??o e Seus Efeitos na Dinamica da Lagoa dos Patos, Brasil," Master ' s Thesis, University of Rio Grande, Rio Grande do Sul, 2005.

[16] C. Torrence and G. P. Compo, "A Practical Guido to Wavelet Analysis," Bulletin of the American Meteorolo- gical Society, Vol. 79, No. 1, 1998, pp. 61-78.

[17] N. P. Smith, "Water, Salt and Heat Balance of Coastal Lagoons," Elsevier Oceanography Studies, Vol. 60, 1994, pp. 69-101. doi:10.1016/S0422-9894(08)70009-6

[18] A. Harten, "High Resolution Schemes for Hyperbolic Conservation Laws," Journal Computational Physics, Vol. 49, No. 3, 1983, pp. 357-393. doi:10.1016/0021-9991(83)90136-5

[19] C. A. J. Fletcher, "Computational Techniques for Fluid Dynamics, Vol. 1: Fundamental and General Techniques," Springer-Verlag, Berlin/New York, 1988.

[20] L. H. Kanta and C. A. Clayson, "Numerical Models of Ocean and Ocean Processes," International geophysics series, Vol. 66, Academic Press, California, 2000.

[21] L. C. Walstra, L. C. Van Rijn, H. Blogg and M. Van Ormondt, "Evaluation of a Hydrodynamic Area Model Based on the COAST3D Data at Teignmouth 1999, Report TR121-EC MAST Project No MAS3-CT97-0086," HR Wallinford, UK, 2001, pp. D4.1-D4.4.

[22] W. M. Cameron and D. Pritchard, "Estuaries," In: M. N. Hill, Ed., The Sea, Vol II, John Wiley and Sons, New York, 1963.

[23] O. O. M?ller and P. Castaing, "Hydrographical Charac- teristics of the Estuarine Area of Patos Lagoon (30 ° S, Brazil)," In: G. M. Perillo, M. C. Piccolo and M. Pino, Eds., Estuaries of South America: Their Geomorphology and Dynamics, Springer Verlag, Berlin, 1999.

[24] R. M. Castel?o and O. O. M?ller, "A Modeling Study of Patos Lagoon (Brazil) Flow Response to Idealized Wind and River Discharge: Dynamical Analysis," Brazilian Journal of Oceanography, Vol. 54, No. 1, 2006, pp. 1-17.

[25] R. W. Garvine, "A Simple Model of Estuarine Subtidal Fluctuations Forced by Local and Non Local Remote Wind Stress," Journal of Geophysical Research, Vol. 90, No. C6, 1985, pp. 11945-11948. doi:10.1029/JC090iC06p11945

[26] R. W. Garvine, "Subtidal Frequency Estuary-Shelf Intera- ction: Observartions near Delaware Bay," Journal of Geophysical Research, Vol. 96, No. C4, 1991, pp. 7049- 7066. doi:10.1029/91JC00079

[27] W. C. Marques, E. H. Fernandes, I. O. Monteiro and O. O. M?ller, "Numerical Modeling Numerical Modeling of the Patos Lagoon Coastal Plume, Brazil," Continental Shelf Research (2008), Vol. 29, No. 3, 2009, pp. 556-571. doi:10.1016/j.csr.2008.09.022