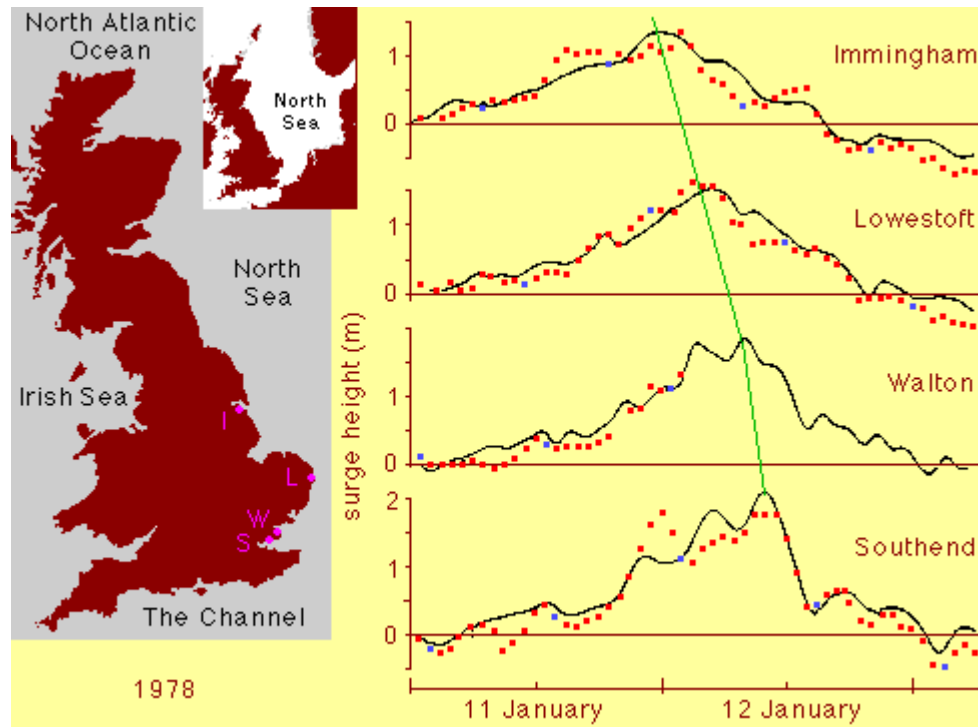


Efeito do vento





Efeito do vento

- Formas de ação (Weisberg, 1976; Elliot and Wang, 1978)
 - Efeito remoto – transporte de Ekman – variações de nível na costa
 - Efeito local – desníveis no interior do estuário
 - (des)intensificação de correntes, influência na circ. Gravitacional

Combinação dos efeitos depende:

Orientação do estuário

Hemisfério

Dimensões e posição da desembocadura

Efeito do vento

- Efeito remoto
 - Vento paralelo à costa
 - Modelo de Ekman
 - Hemisfério Sul:
 - Ventos de NE - ressurgência – abaixamento de nível
 - Ventos de S(SW) Subsidiência – elevação de nível na costa
 - Variações de nível – passagens de frente, modelo do Stech e Lorenzetti (1992), Castro (1995)

Efeito do vento

- Efeito local
 - Desníveis – setup/setdown
 - Dupla circulação – correntes de retorno no fundo
 - » Upwind return flow – Indian river (Pitts, 1989)
 - Modelos para cálculo
 - Van Dorn (1953) – açude, uso de detergente
 - Pollak (1961) – Chesapeake Bay
 - Garvine (1985) – modelo teórico

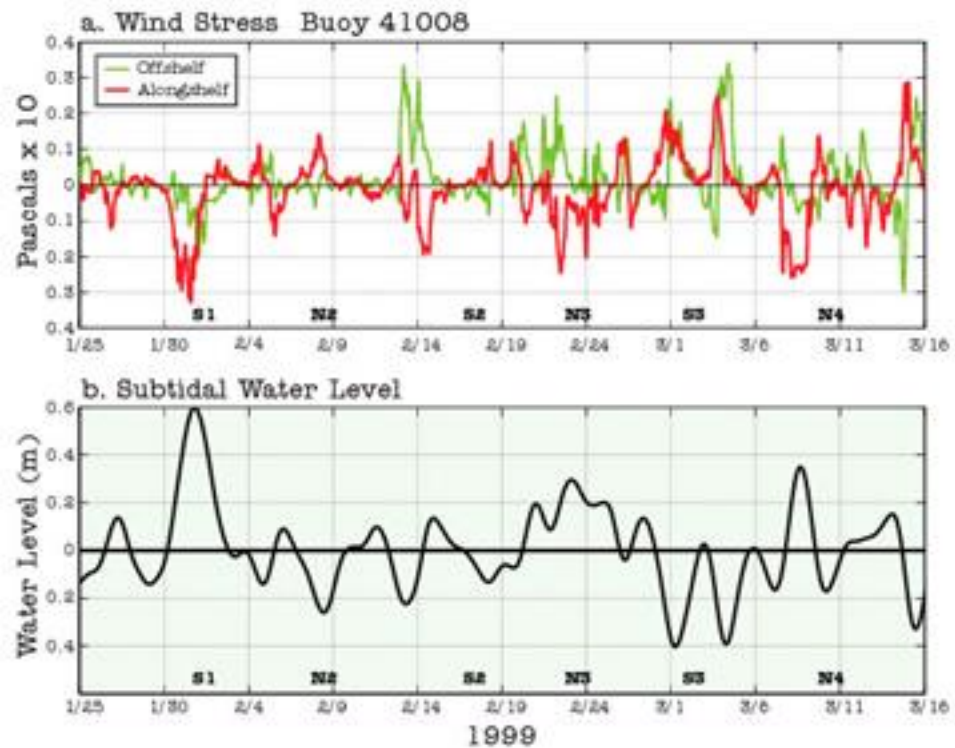


Figure 6: Temporal changes of coastal wind stress components (a) compared to water level changes (b) at Station 4. "N" and "S" mark times of neap and spring tide respectively.

Vento soprando sobre uma bacia fechada de profundidade uniforme

$$\tau_w = \rho_{ar} C_w W^2$$

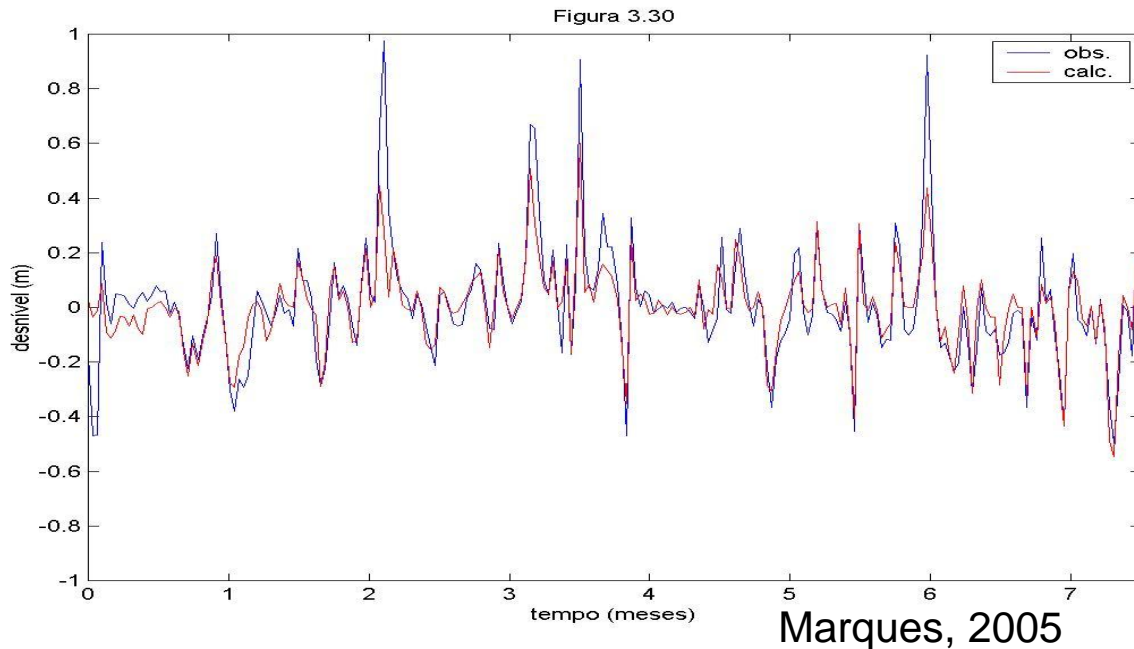
$$C_w = 0.001$$

$$\rho_{ar} = 1.25 \text{ kg} / \text{m}^3$$

$$p(z) = g\rho(\eta - z)$$

$$-\frac{\partial p}{\partial x} = -g\rho \frac{\partial \eta}{\partial x}$$

$$-\int_{-h}^{\eta} \frac{\partial p}{\partial x} dz = -g\rho(h + \eta) \frac{\partial \eta}{\partial x} = \tau_w$$



$$\frac{n\tau_x}{\rho_w H} + g \frac{\partial h}{\partial x} = 0$$

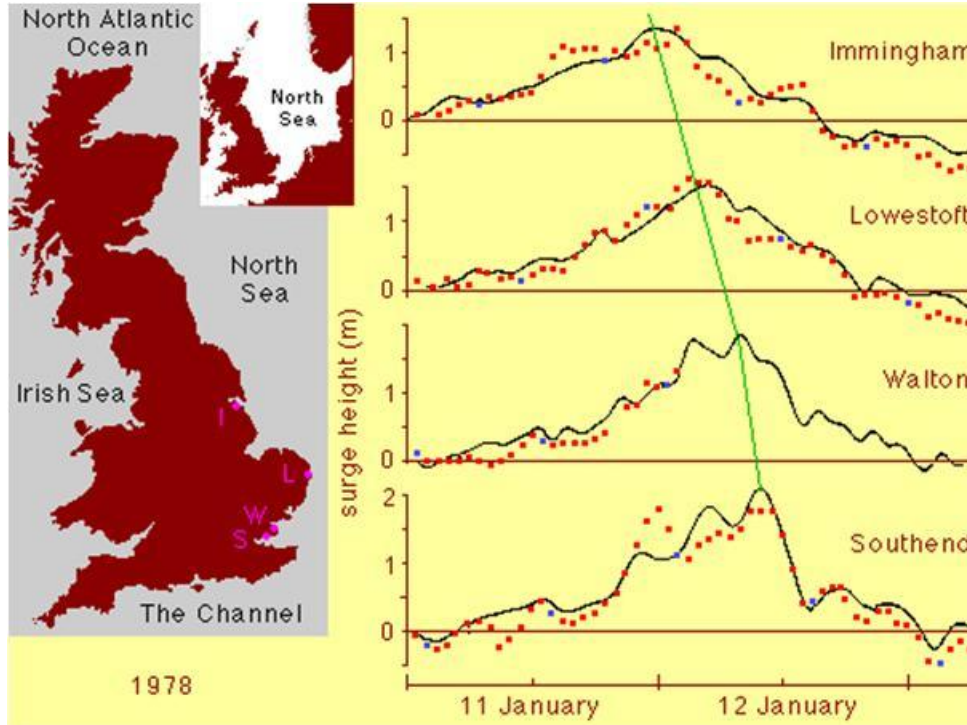
$$\tau_x = \rho_a c_d |u| u$$

Modelo de Pollack (1960)

τ_x é a tensão de cisalhamento do vento, u é a velocidade média do vento, c_d é o coeficiente de cisalhamento do vento, n é um parâmetro adimensional para considerar a influência de efeitos turbulentos, ρ_w é a densidade da água, g é a aceleração da gravidade, H é a profundidade média local, Δh é a variação entre os níveis e Δx é a distância entre as duas estações medidas.

$$V_c = 1,62 + 1,17 V_m \quad (\text{Hsu, 1986})$$

Storm surges – sobrelevações



$$\Delta\eta = \frac{\tau_w L}{\rho g h} = \frac{\rho_a C_w W^2 L}{\rho g h}$$

Não considera rotação e fricção de fundo

L – pista do vento

H= 10 m, W= 20 m/s L=100 km

Efeito do vento Lagoa dos Patos

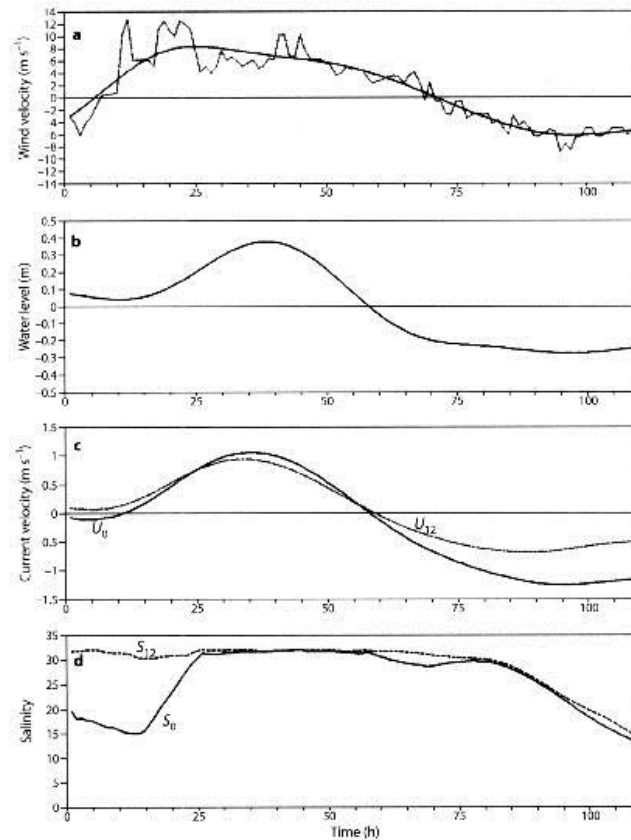
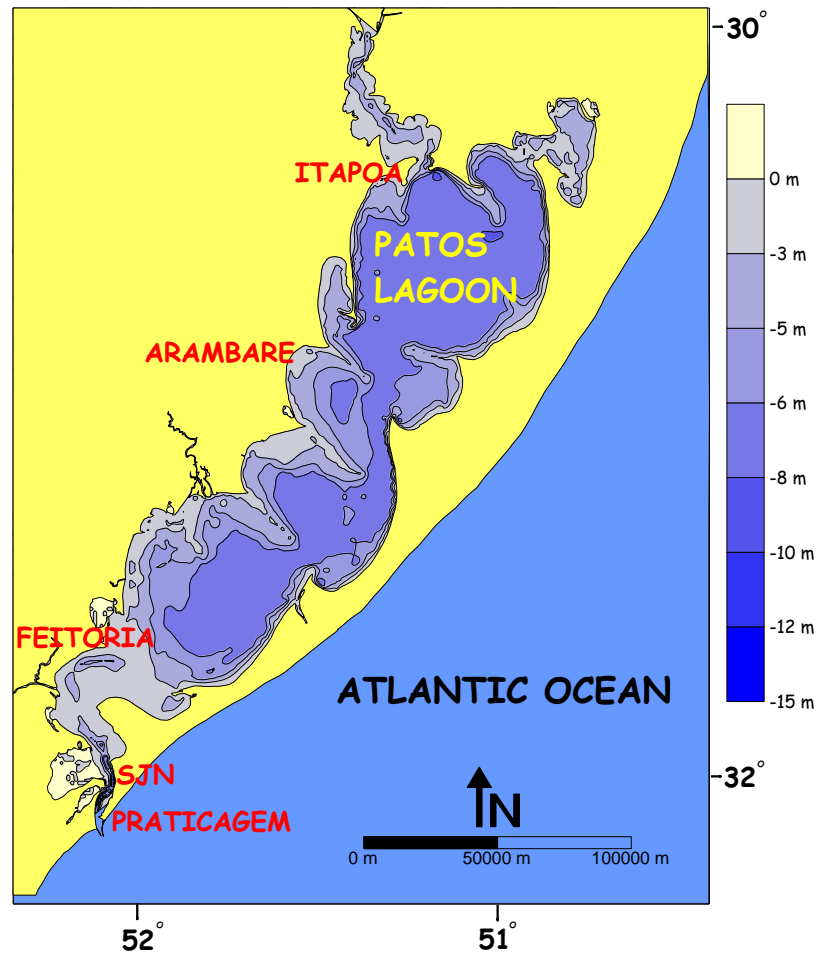
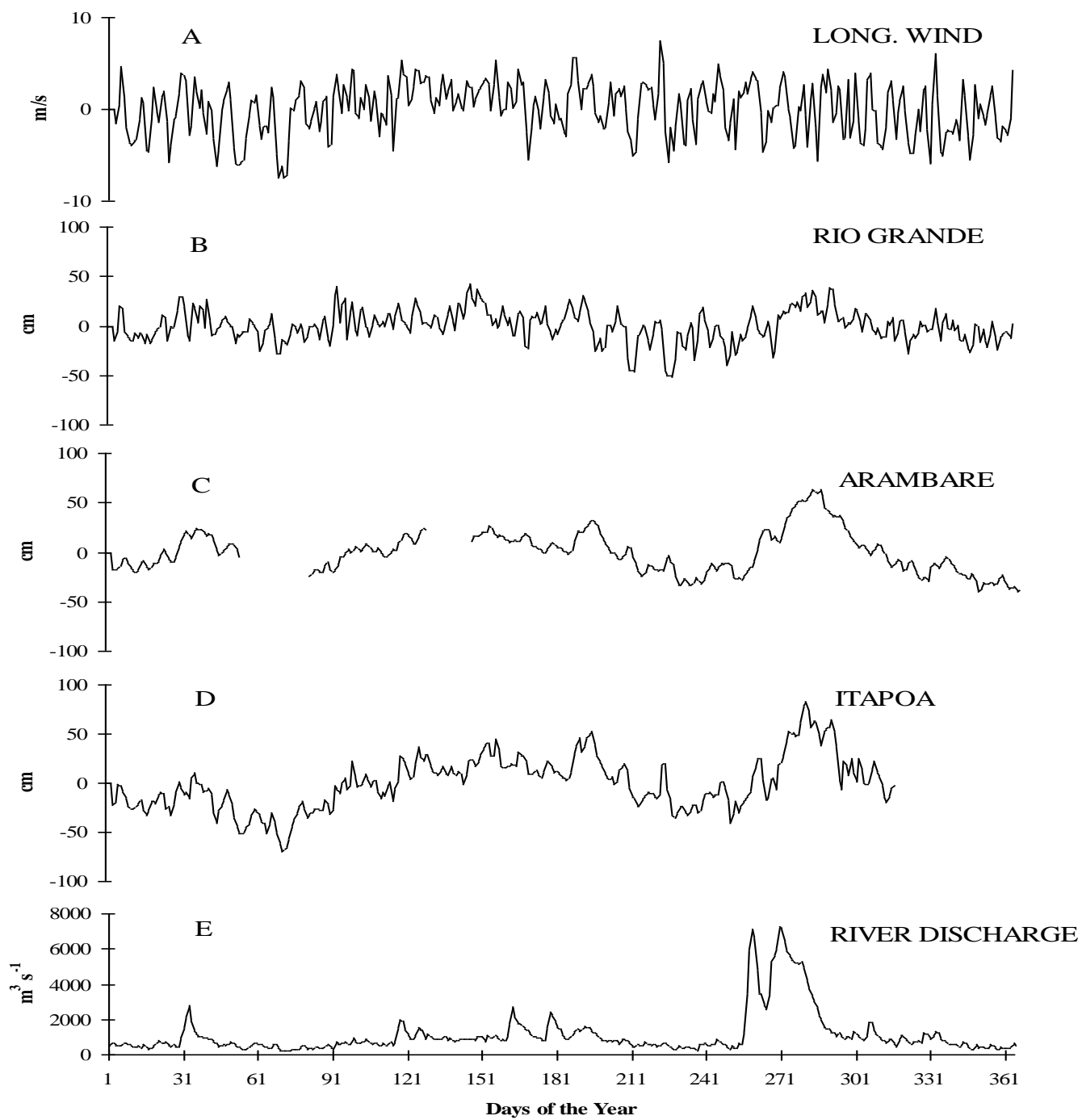


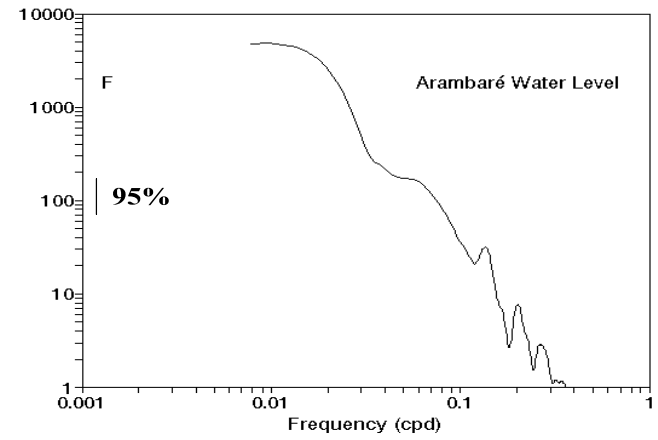
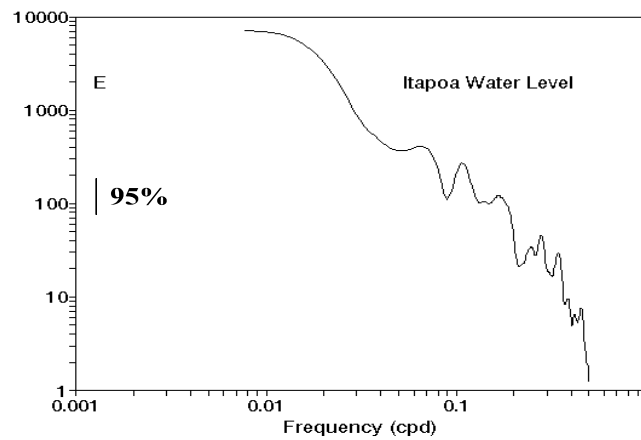
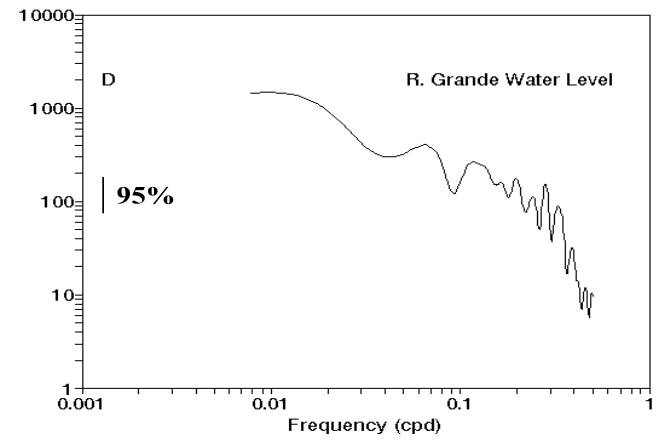
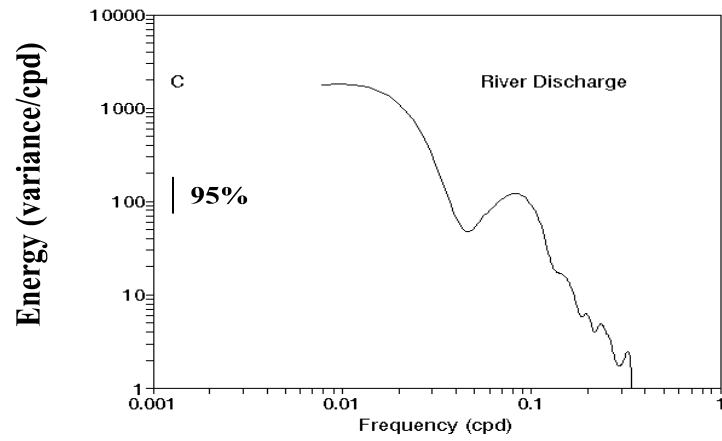
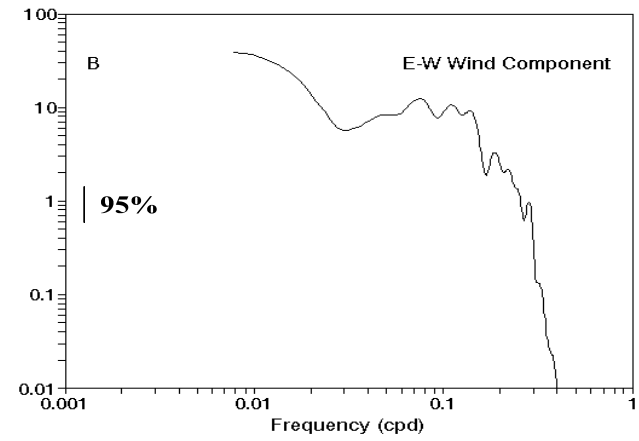
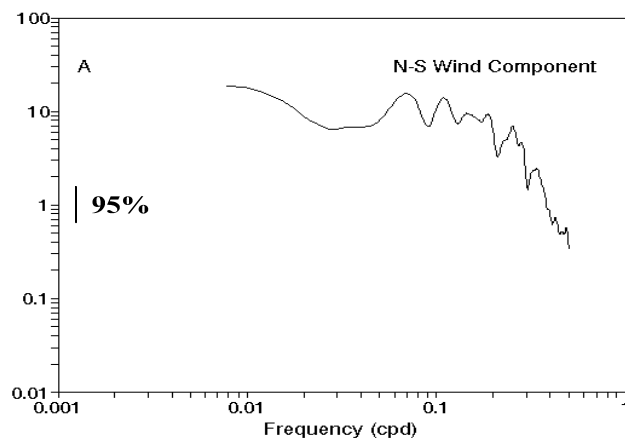
Fig. 5.8. Time series of **a** longitudinal wind velocity, **b** water level, **c** longitudinal current velocity component and **d** salinity for surface (U_0 , S_0) and 12 m (U_{12} , S_{12}) obtained during PLATES I. Unfiltered data (*a*, *b*) are represented by *dotted lines* (data from Praticagem station)

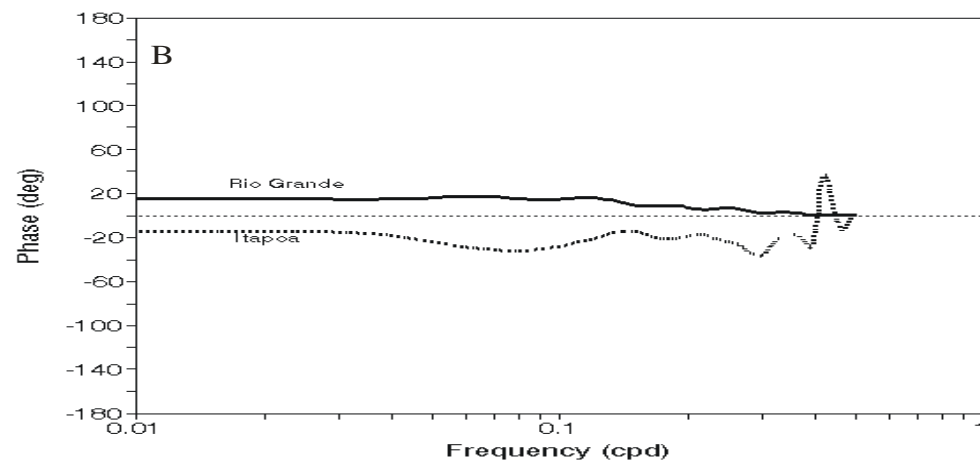
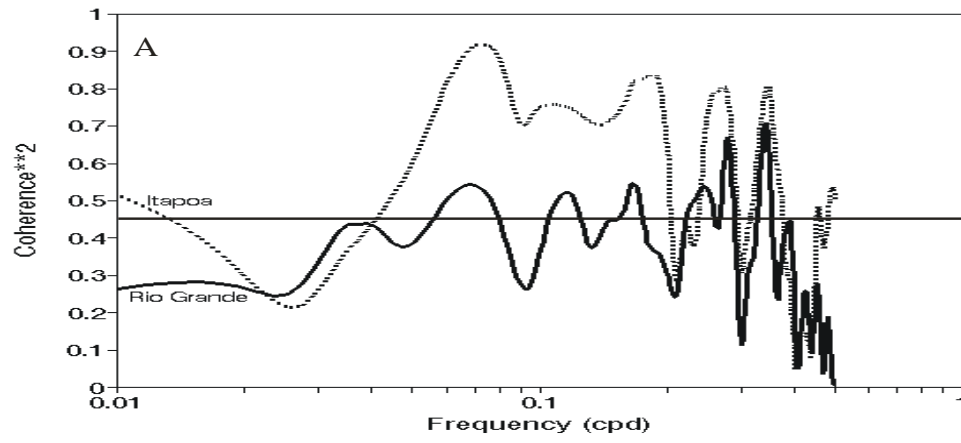
Efeito do vento

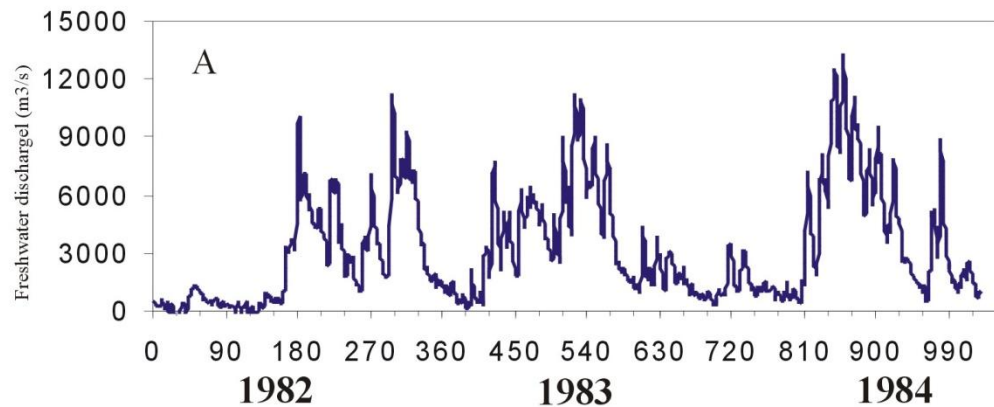
Lagoa dos Patos





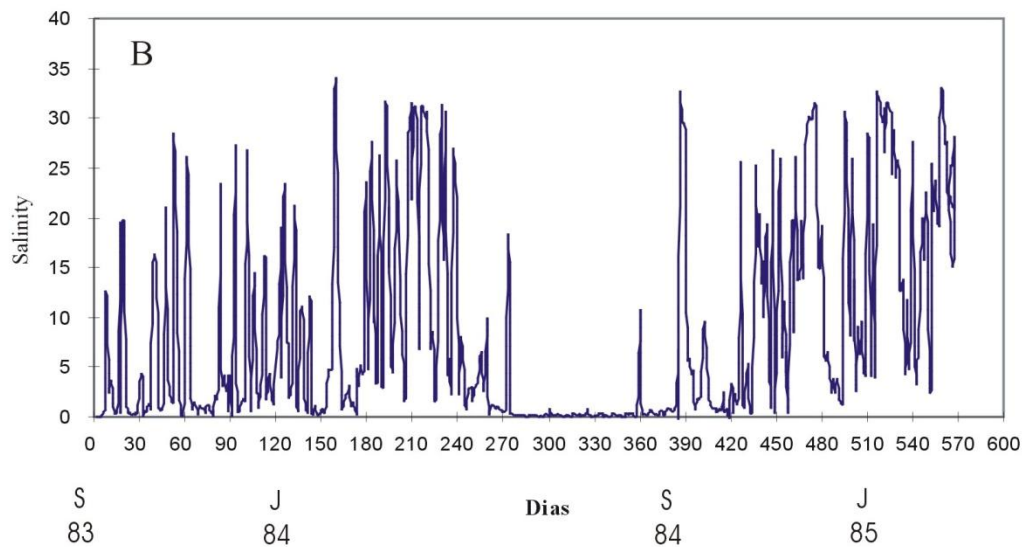






A) Freshwater discharge in Patos Lagoon area from Jan/82 a Nov/84

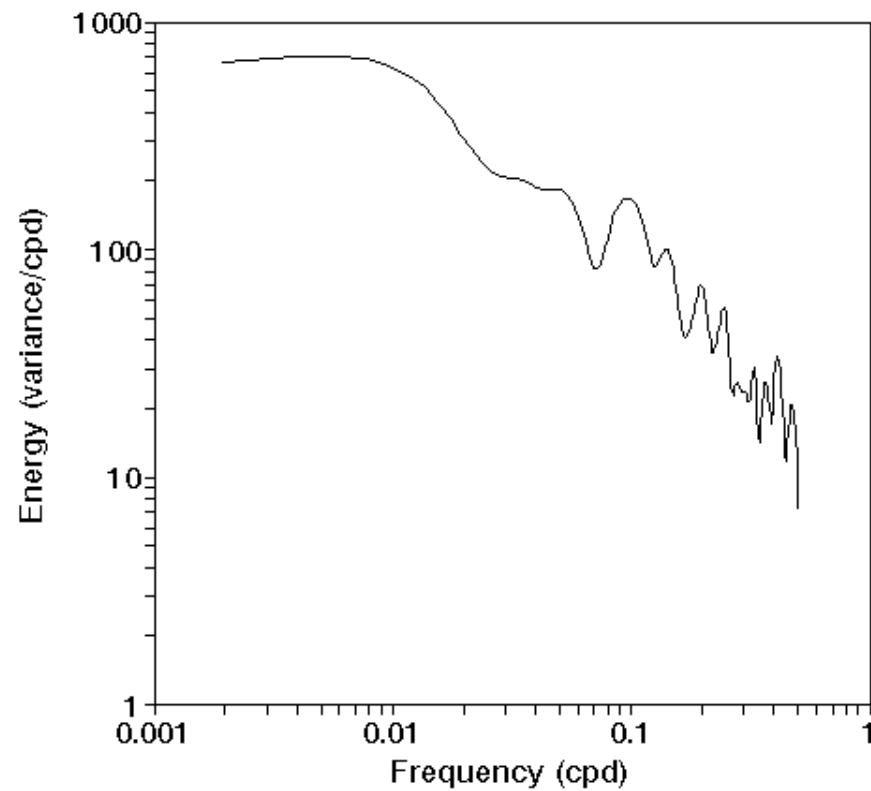
Paim e Möller Jr. (1986)

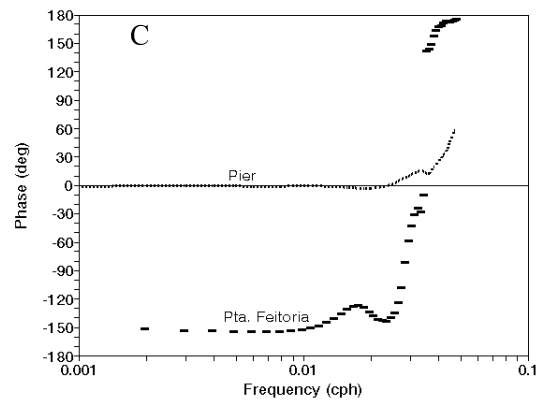
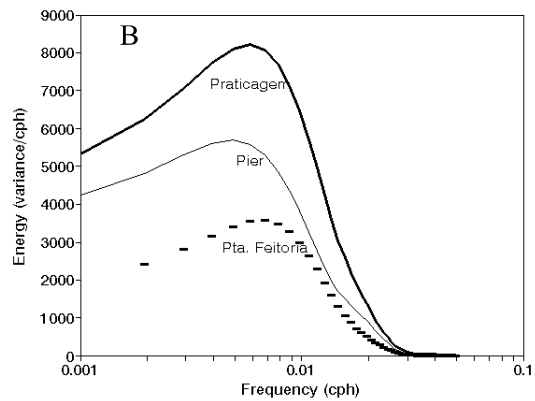
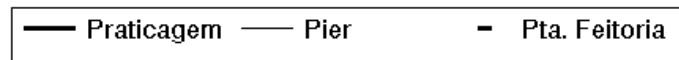
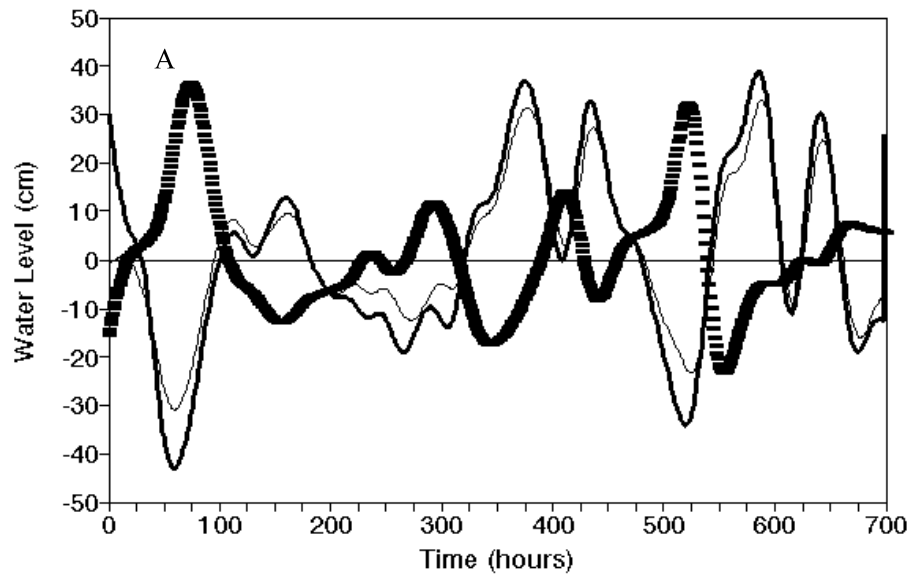


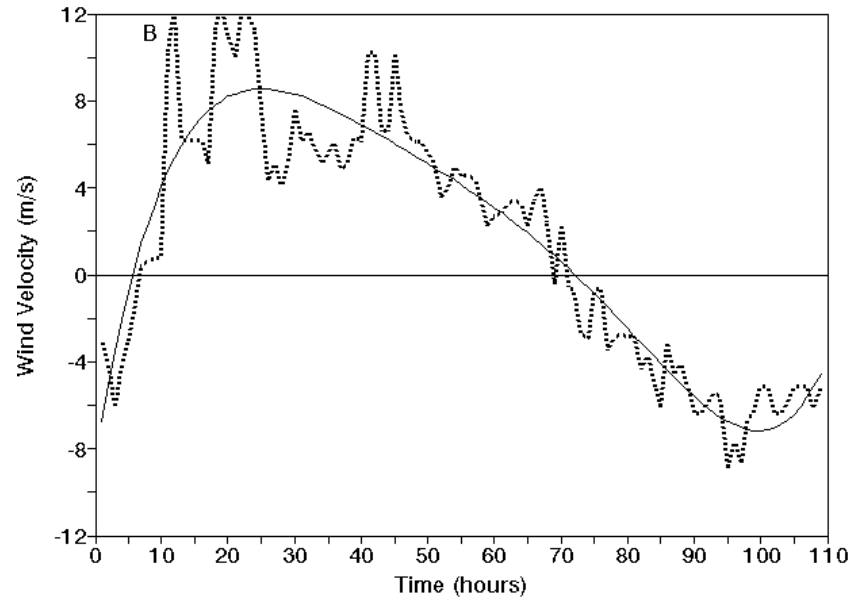
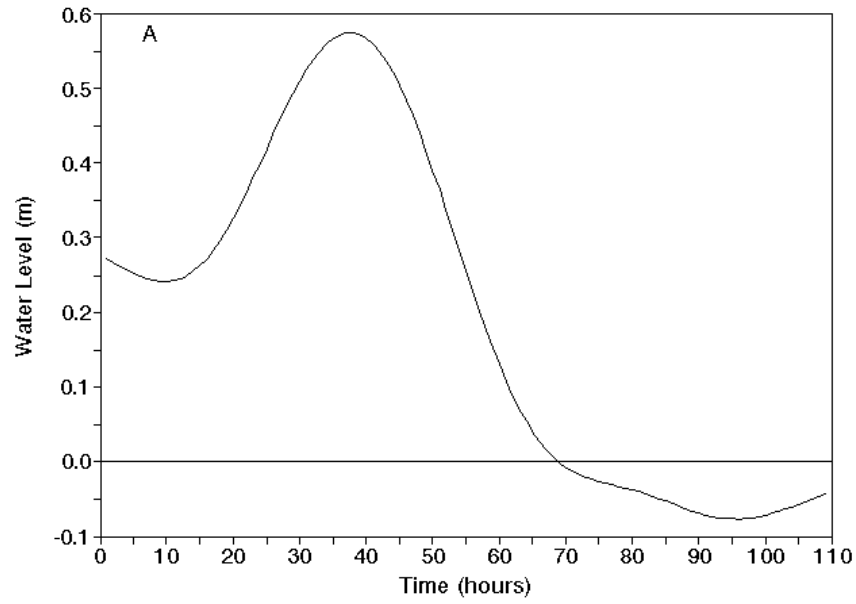
B) Surface salinity temporal variation in the entrance channel area from Set/83 a Mar/85

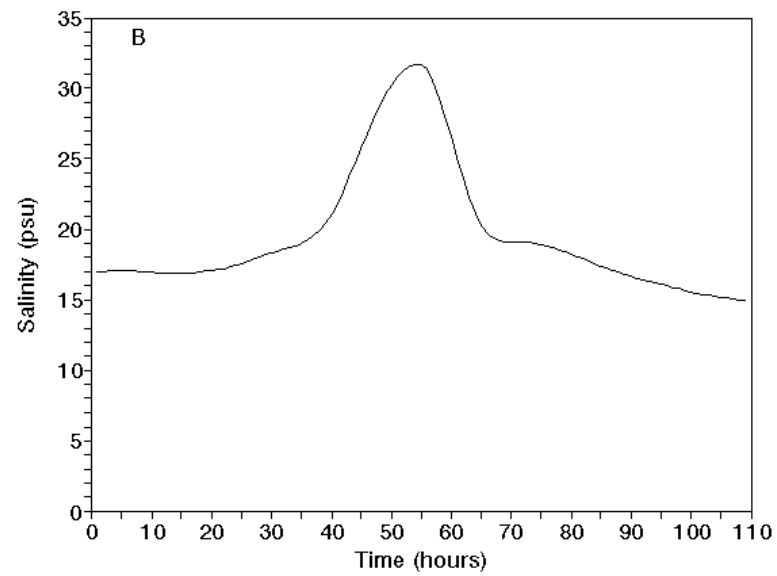
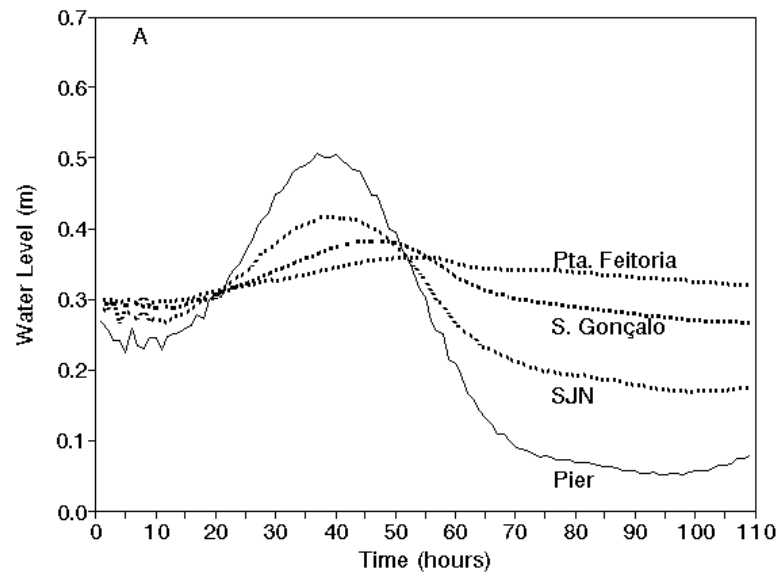
Baumgarten e Niencheski (1986)

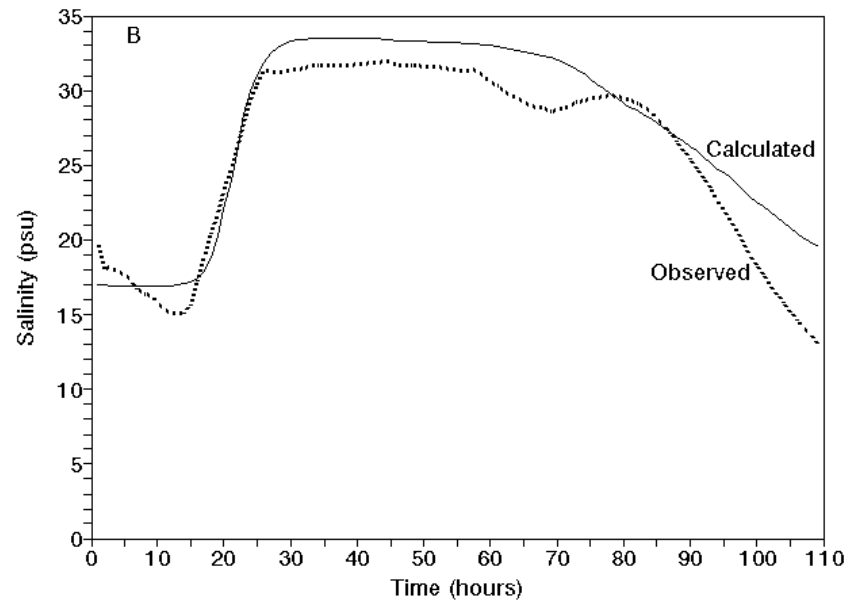
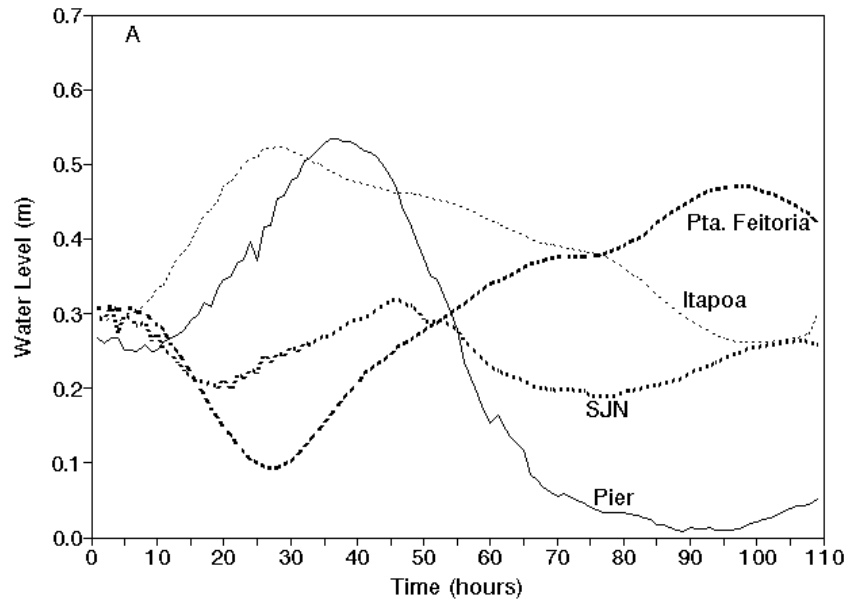
Análise espectral de dados de salinidade da superfície entre 1983 e 1985

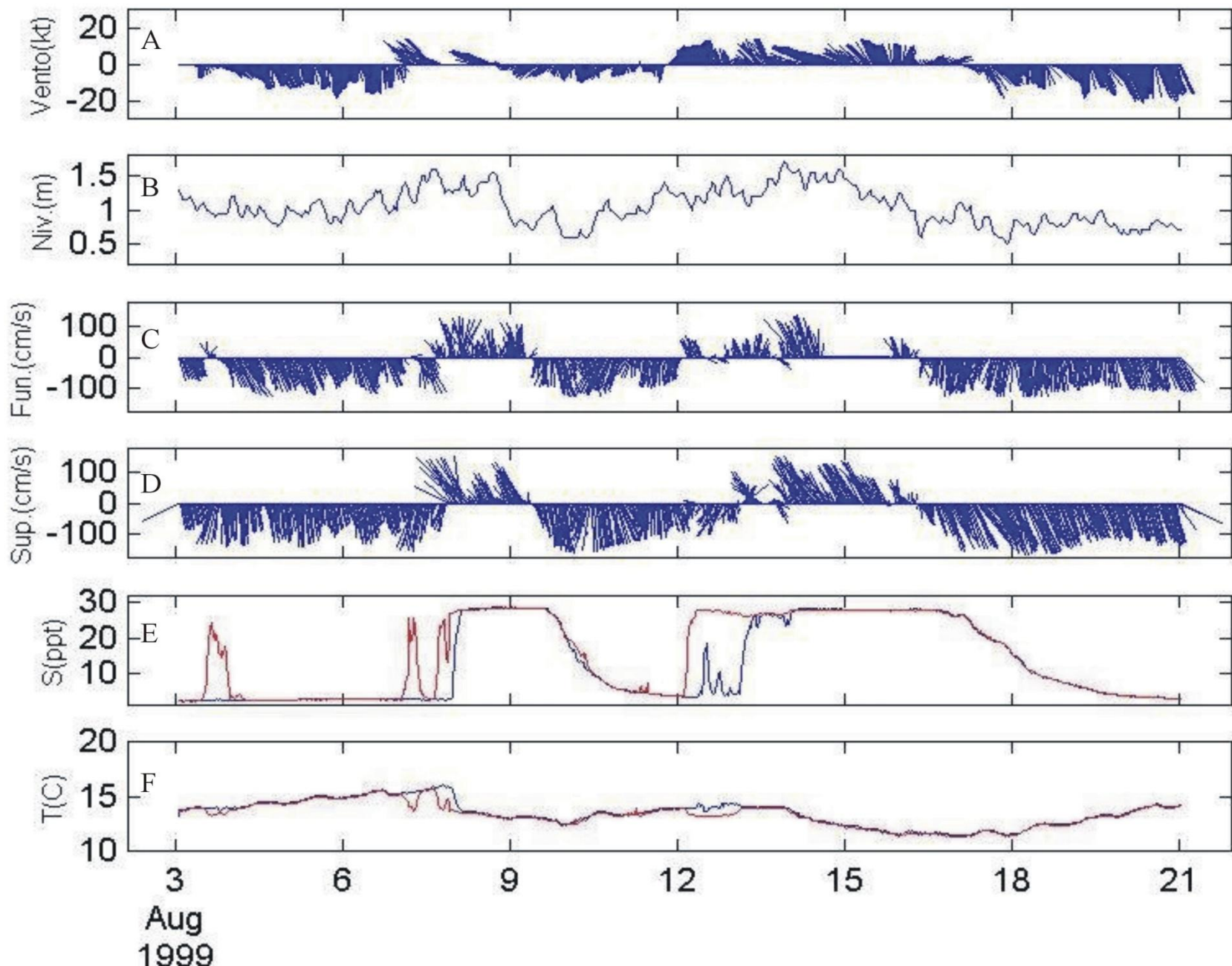


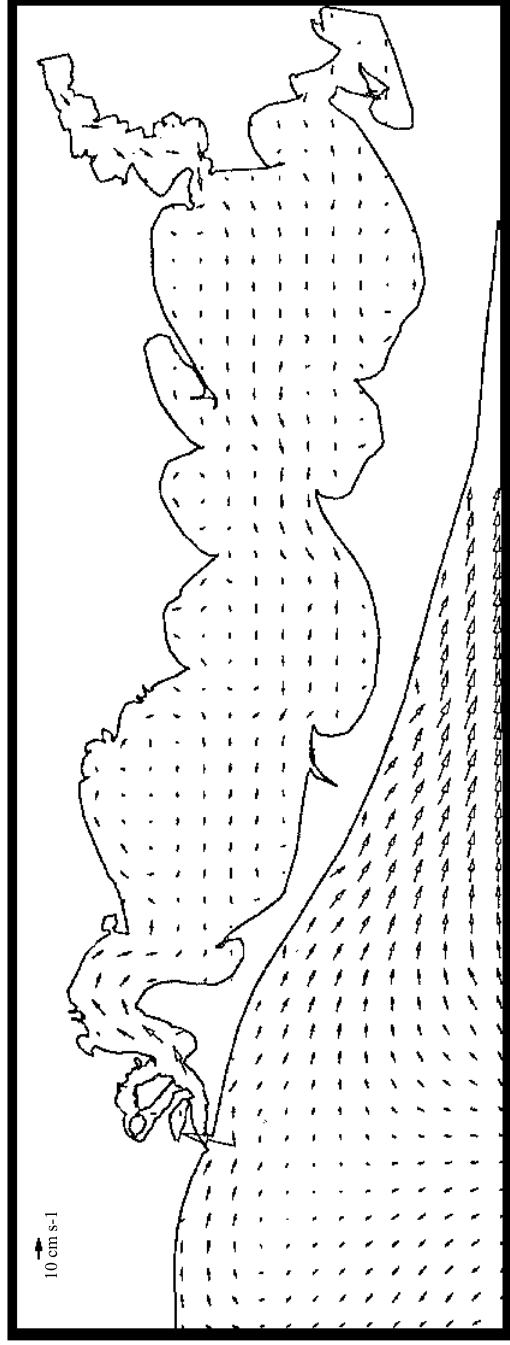
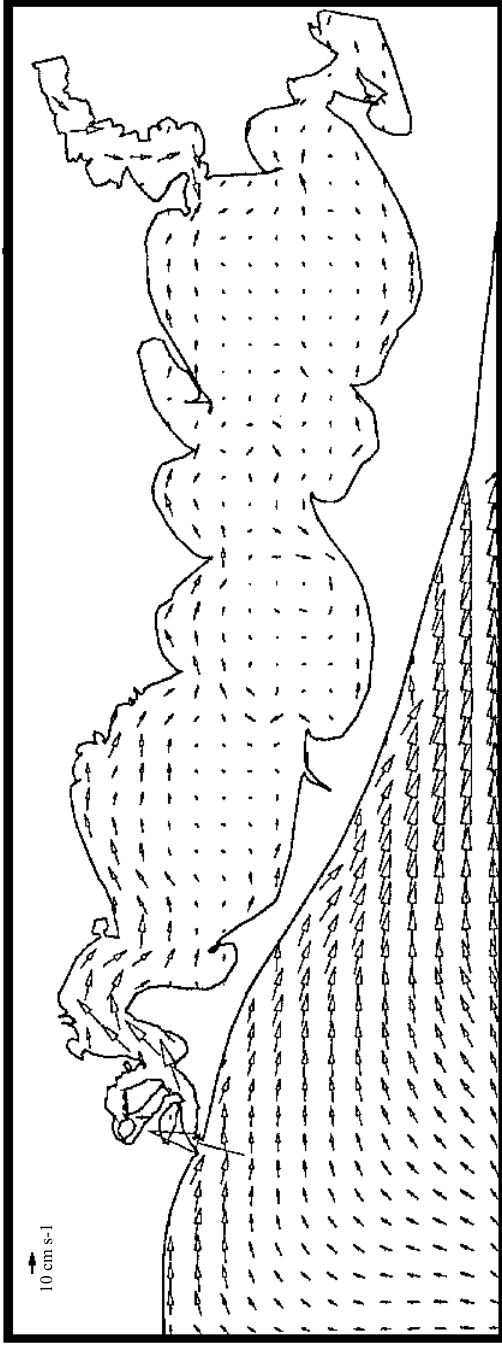


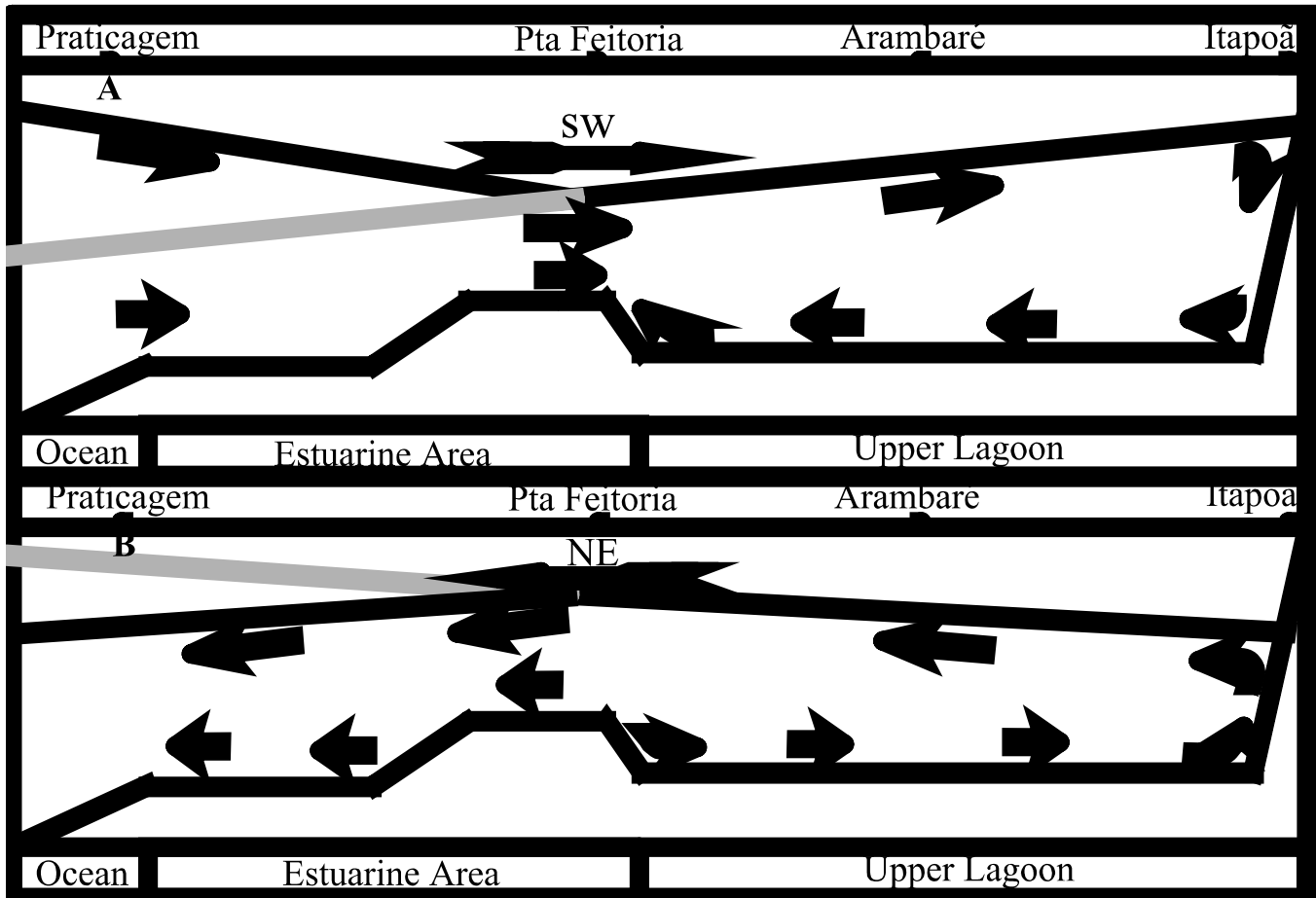




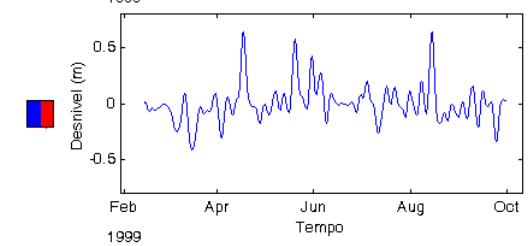
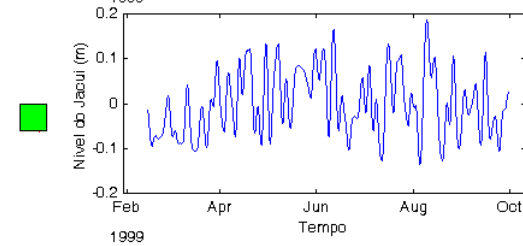
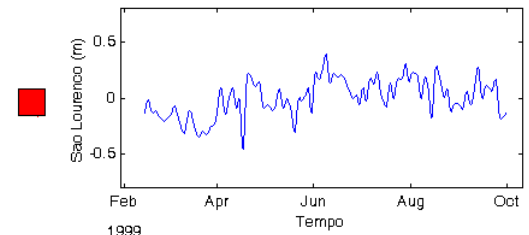
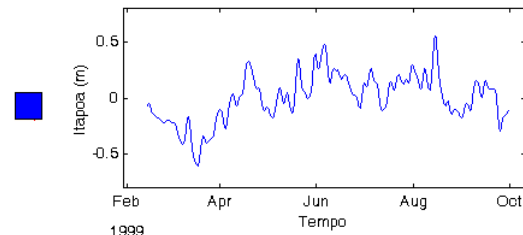
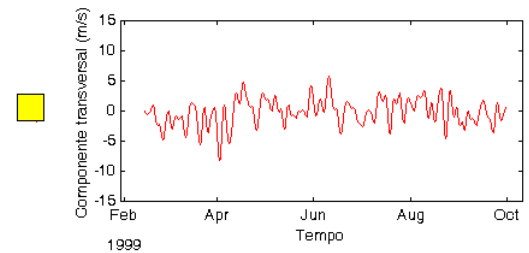
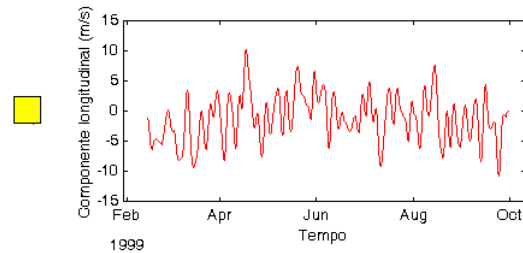
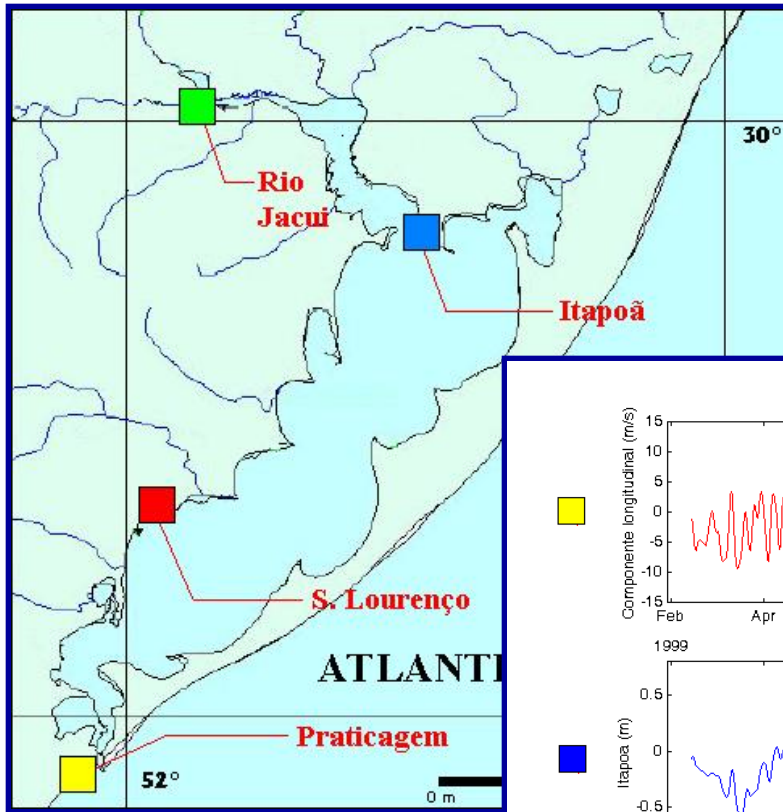








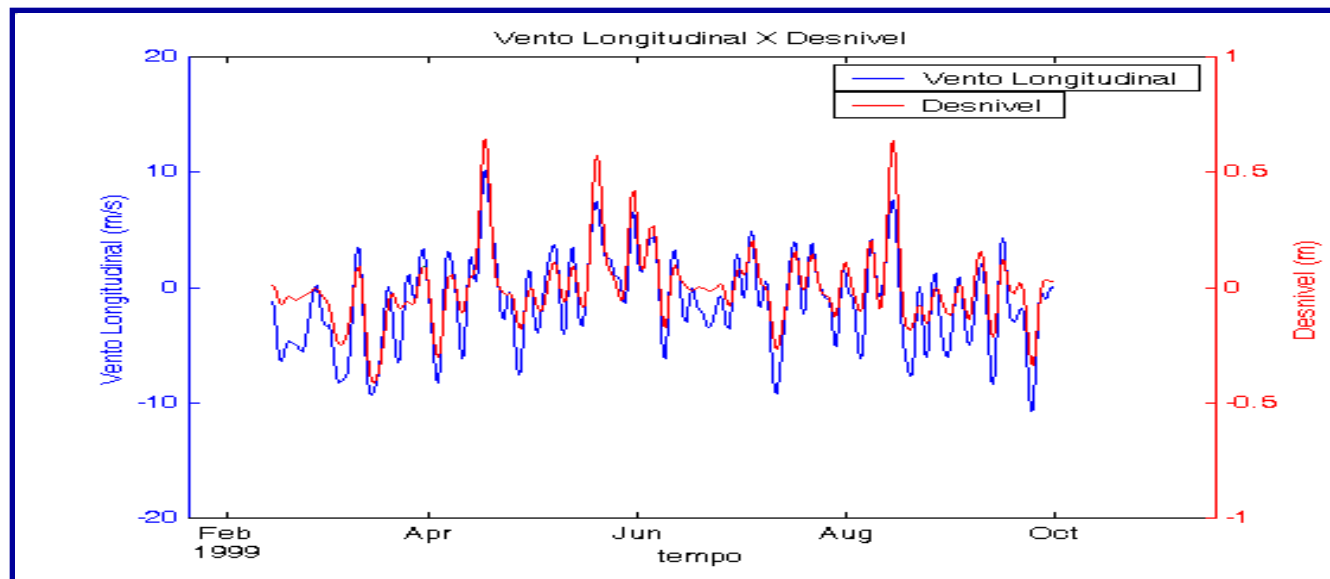
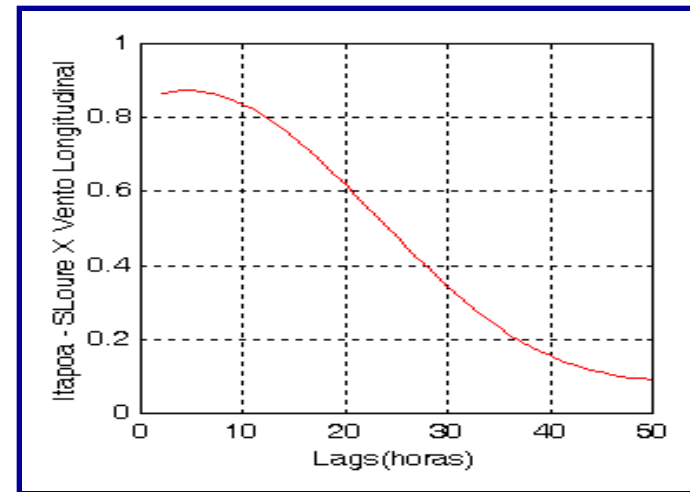
Estações



Resultados

Geração de desníveis

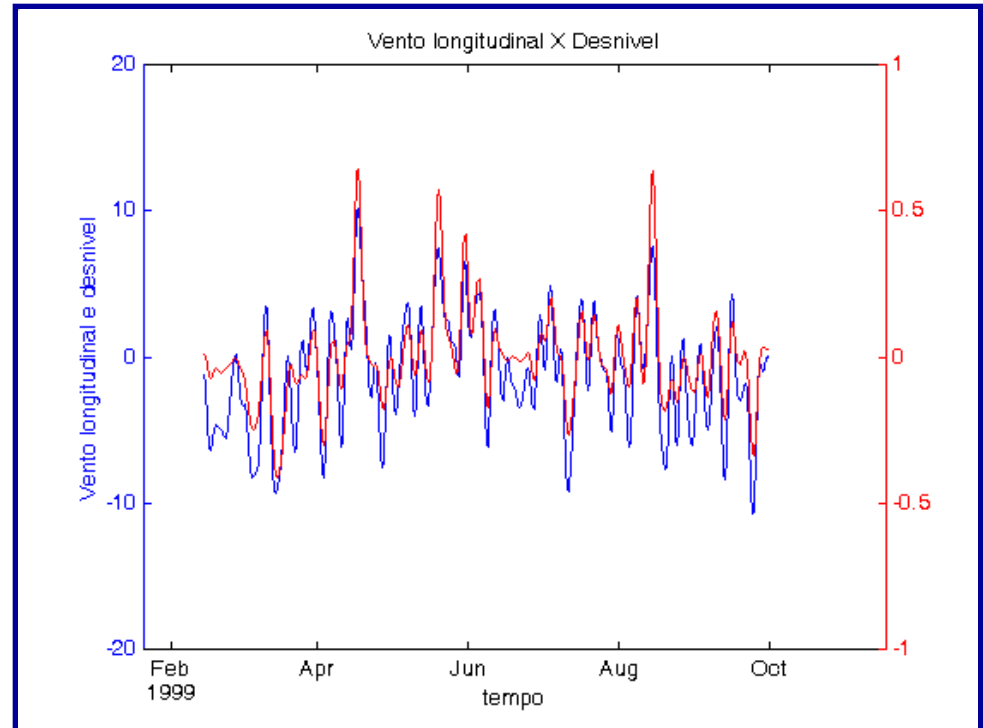
A ação do vento na geração de desníveis se dá em poucas horas encontrando-se alta correlação entre estes dois fatores.



Resultados

Efeito sobre o fluxo dos rios

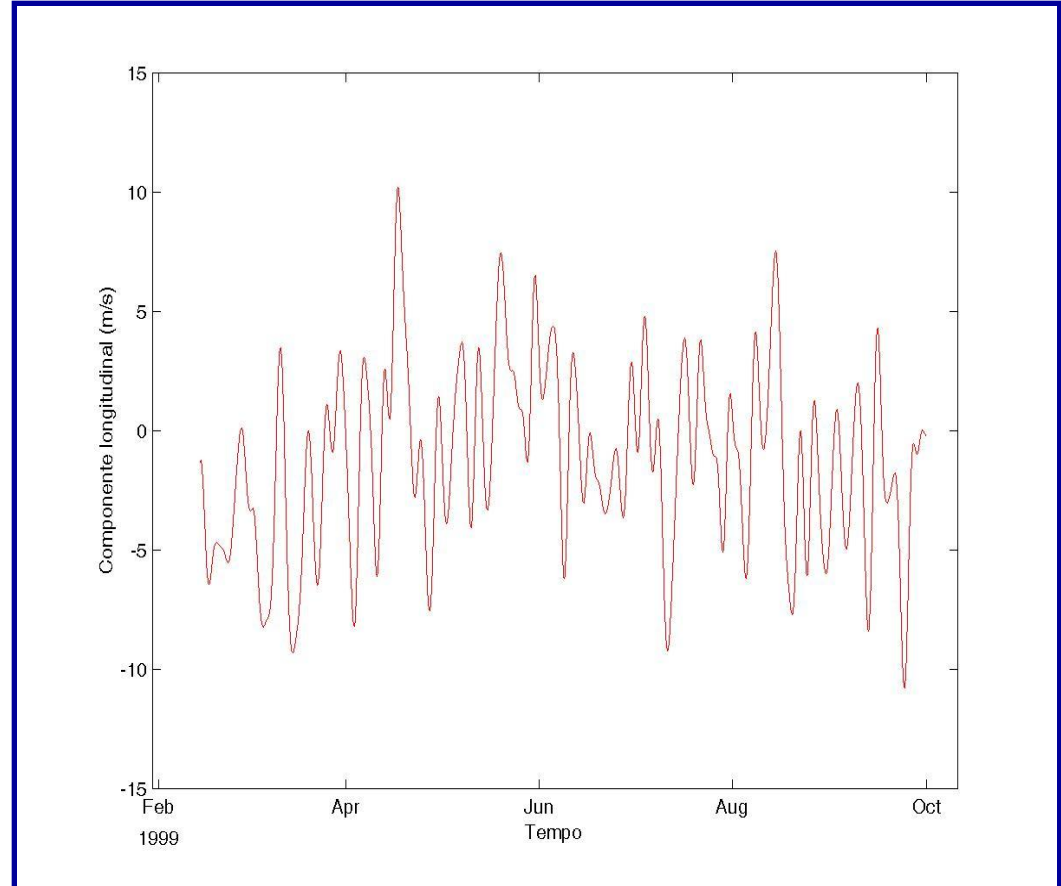
Esta ação de vento produz efeitos mesmo nas partes mais interna da bacia hidrográfica, ocasionando, em casos de ventos de SW, a inversão do fluxo de rios, como o verificado para o Jacuí.



Resultados

Escalas Temporais Envolvidas

- O vento apresenta duas escalas temporais de ação:
 - Sinóptica, associada a períodos de passagem de frentes, no intervalo entre 3 e 15 dias
 - Sazonal, com aumento das frequências de ventos de SW em outono e inverno



Resultados

Retenção de água no interior da laguna

Em escala sazonal o vento é capaz de reter um grande volume de água no interior da laguna, o que pode ter conseqüências no tempo de renovação das águas e nas trocas com o oceano.

