

Early and Recent Sea Level Measurements in the Brazilian Coast

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ABSTRACT

Sea Level measurements started in Brazilian coast in the year 1781, with the Portuguese astronomer Sanches Dorta interested in studying the attraction between masses, applied to the oceanic tides. Port of Rio de Janeiro was occupied, during the year 1831, for the first measurements performed in the Brazilian coast. The recorded sea level of that time is kept nowadays in the Library of the Directory of Hydrography and Navigation (DHN) of the Brazilian Navy. First analyses were made by the National Observatory (ON). The measurements of 1831 were included into a law in 1946, to serve as the sea level national reference for determining the sea /land limits of the country. The datum in the Port of Rio de Janeiro, was lost, leaving the law inapplicable. A method of recovering this basic limit was produced, according to the terms of the 1946 law and the estimation of the local long term trend, as around 40 cm per century. Values of correlation and proximity from the Permanent Service for the Mean Sea Level (PSMSL) allowed the definition of a function F, to measure a sort of state of variability, characteristic of each port. Extreme value events the port of Cananeia, indicating average values of 2,80 m above mean sea level, Prospects of further studies rely on a oceanographic annually section in the South Eastern coast, for the steric and halosteric sea levels which, with the measurements already being taken at Cananeia and Ubatuba, should allow to locally estimate the values all basic components of the sea level and their long term variability.

HISTORIC

Sea Level measurements started in Brazilian coast in the year 1781, with the Portuguese astronomer Sanches Dorta interested in studying the attraction between masses, applied to the oceanic tides; law discovered by Isack Newton and later confirmed by Henry Cavendish in the eighteenth century. Soon after the transfer of the Portuguese Crown from Europe to Brazil, fearing Napoleon troops, in 1808, the Port of Rio de Janeiro was occupied, during the year 1831, for the first systematic sea level measurements performed in the Brazilian coast. The recorded sea level of that time is kept nowadays in the Library of the Directory of Hydrography and Navigation (DHN) of the Brazilian Navy. After the amicable separation of the Kingdoms of Portugal and Brazil, in 1822, and after the proclamation of the Brazilian Republic in 1889, systematic sea level measurements in several ports along the coast were organized. First analyses based on these measurements were made by the National Observatory (ON) of the National Council of Research and Technology (CNPq).

SEA LAND LIMITS

The measurements of 1831 were included into a law in 1946, to serve as the sea level national reference for determining the sea /land limits of the country. The datum they were referred to, in the Port of Rio de Janeiro, was lost, leaving the law inapplicable. A method of recovering this basic limit was produced, in order to overcome the difficulties and evaluate more precisely to which mark, on land, is the regional long term sea level presently varying, according to the terms of the 1946 law. Mesquita et al (2003).

LONG TERM SEA LEVEL TRENDS

Sea level series produced by the Instituto Nacional de Pesquisas Hidroviárias (INPH), with the 10 years series obtained by the Geodetic Survey of USA, in various ports, together with the series of Cananeia (IO-USP), allowed the estimation of the local long term trend, as around 40 cm per century..Mesquita et al (2004).

CORRELATION AND PROXIMITY

Values of correlation and proximity from the Permanent Service for the Mean Sea Level (PSMSL) sea level series, with the Brazilian series included, allowed the definition of a function F, which seems to measure a sort of state of variability, characteristic of each port. Mesquita et al (2002).

THE F VALUES

The plots of F against the corresponding trends indicate a negative global sea level decrease. Mesquita Franco & Harari, (2004).

EXTREME SEA LEVEL

The extreme value events were also estimated for the port of Cananeia, indicating average values of 2,80 m above mean sea level, which appear to be representative of all the Brazilian coast. Franco et al (2007).

STERIC AND HALOSTERIC SEA LEVEL

Prospects of further studies rely on a proposed oceanographic annually section in the South Eastern coast, to estimate the steric and halosteric sea levels which, with the measurements already being taken at Cananeia and Ubatuba, ports of the Southeastern area, should allow to locally estimate the values of almost all basic components of the sea level and their long term variability.

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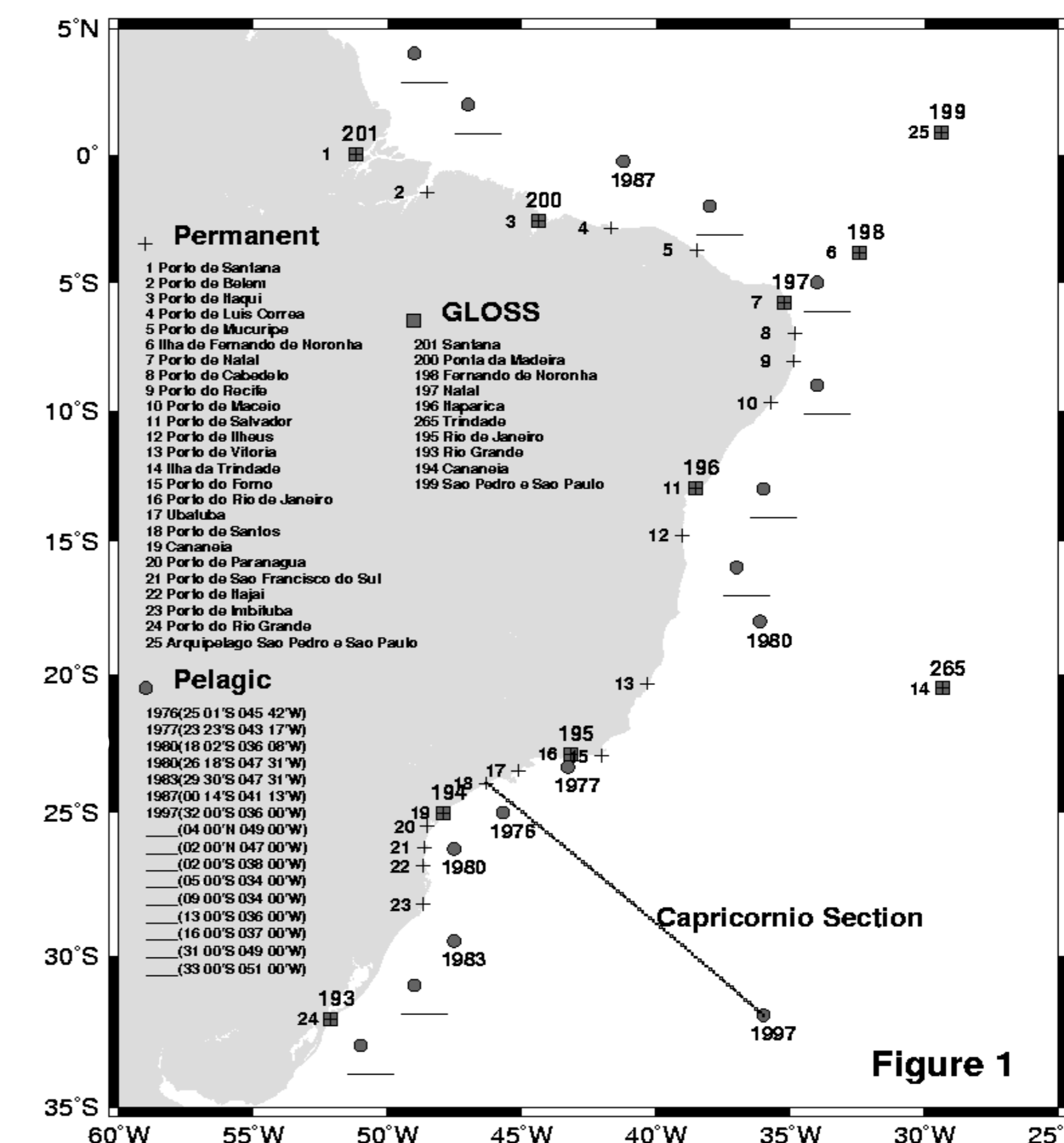
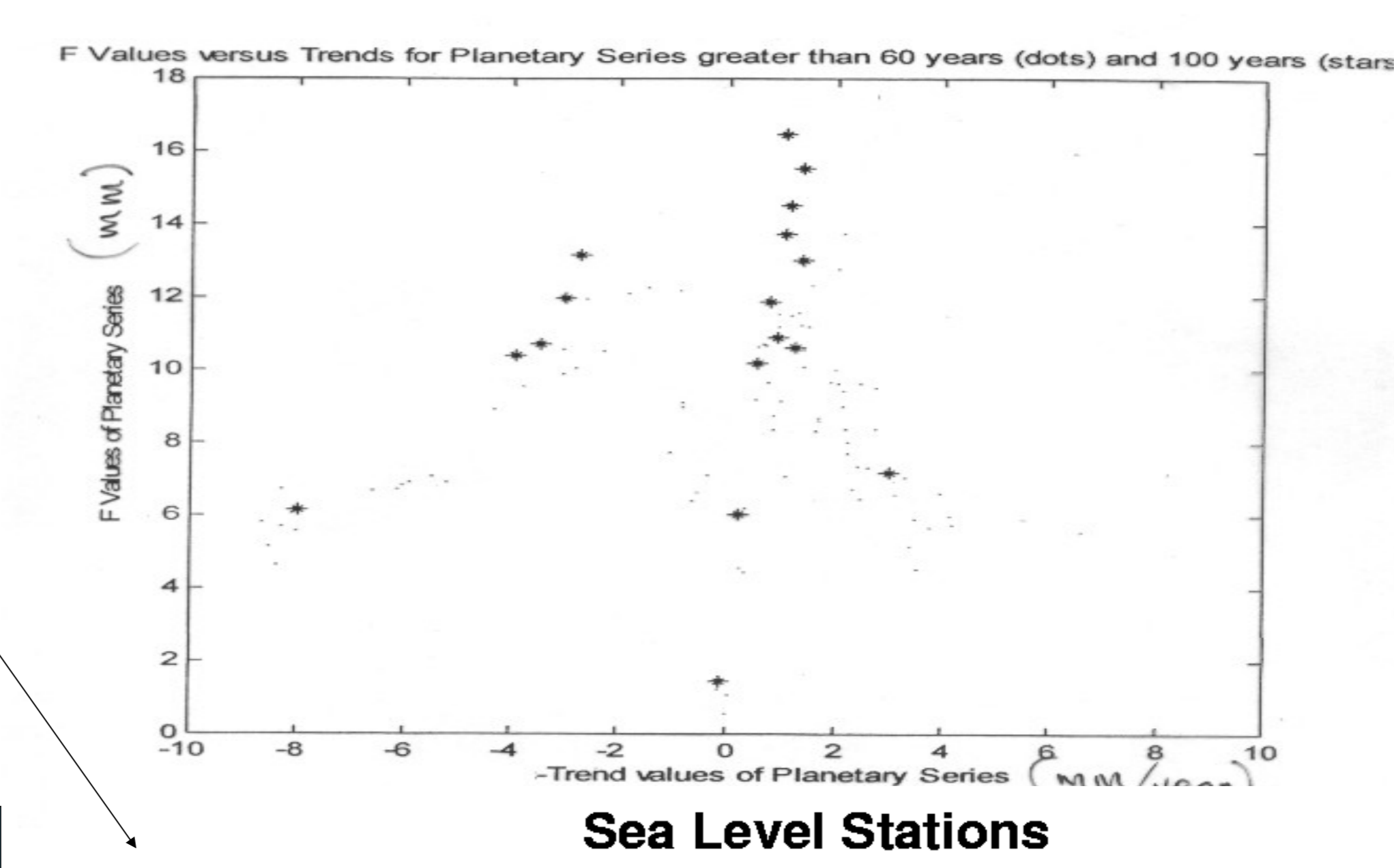
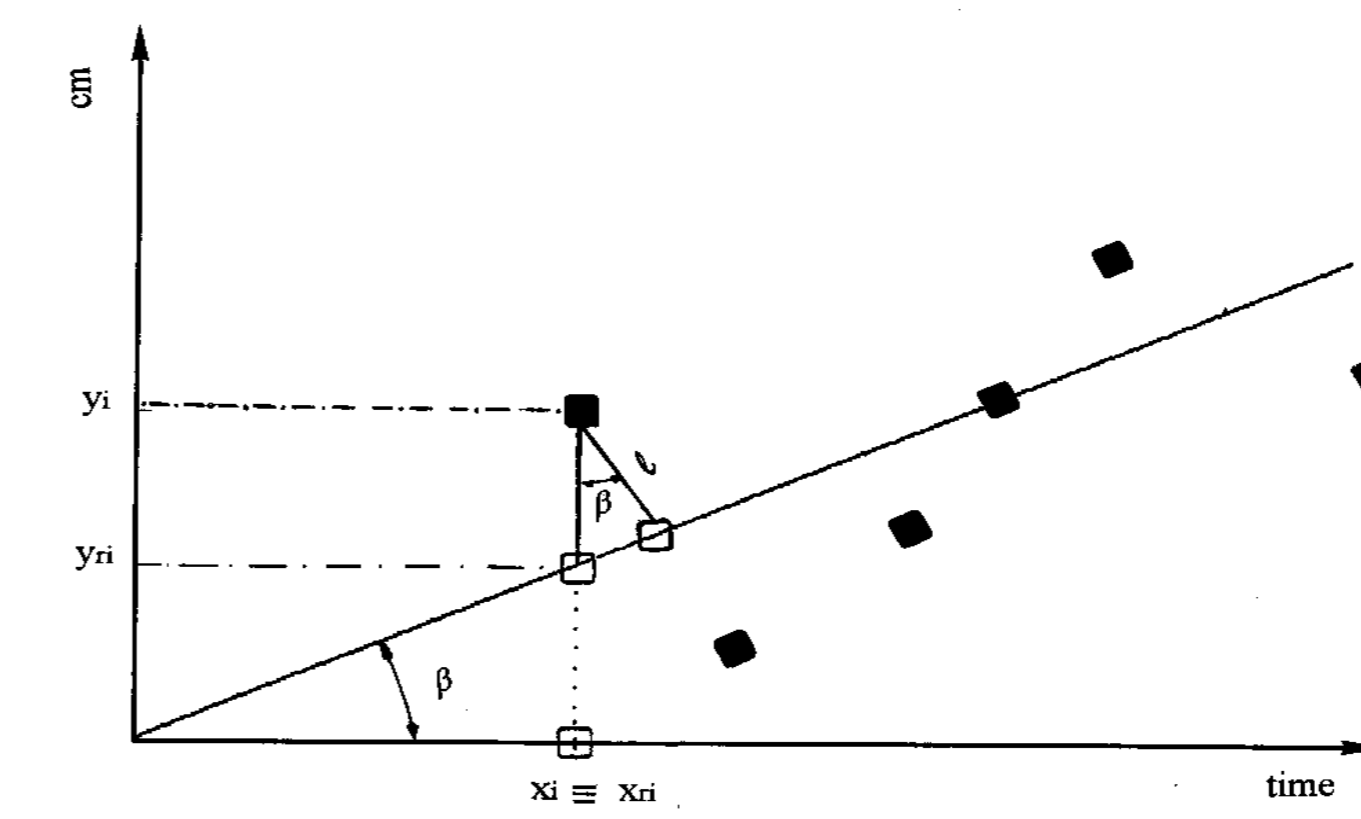
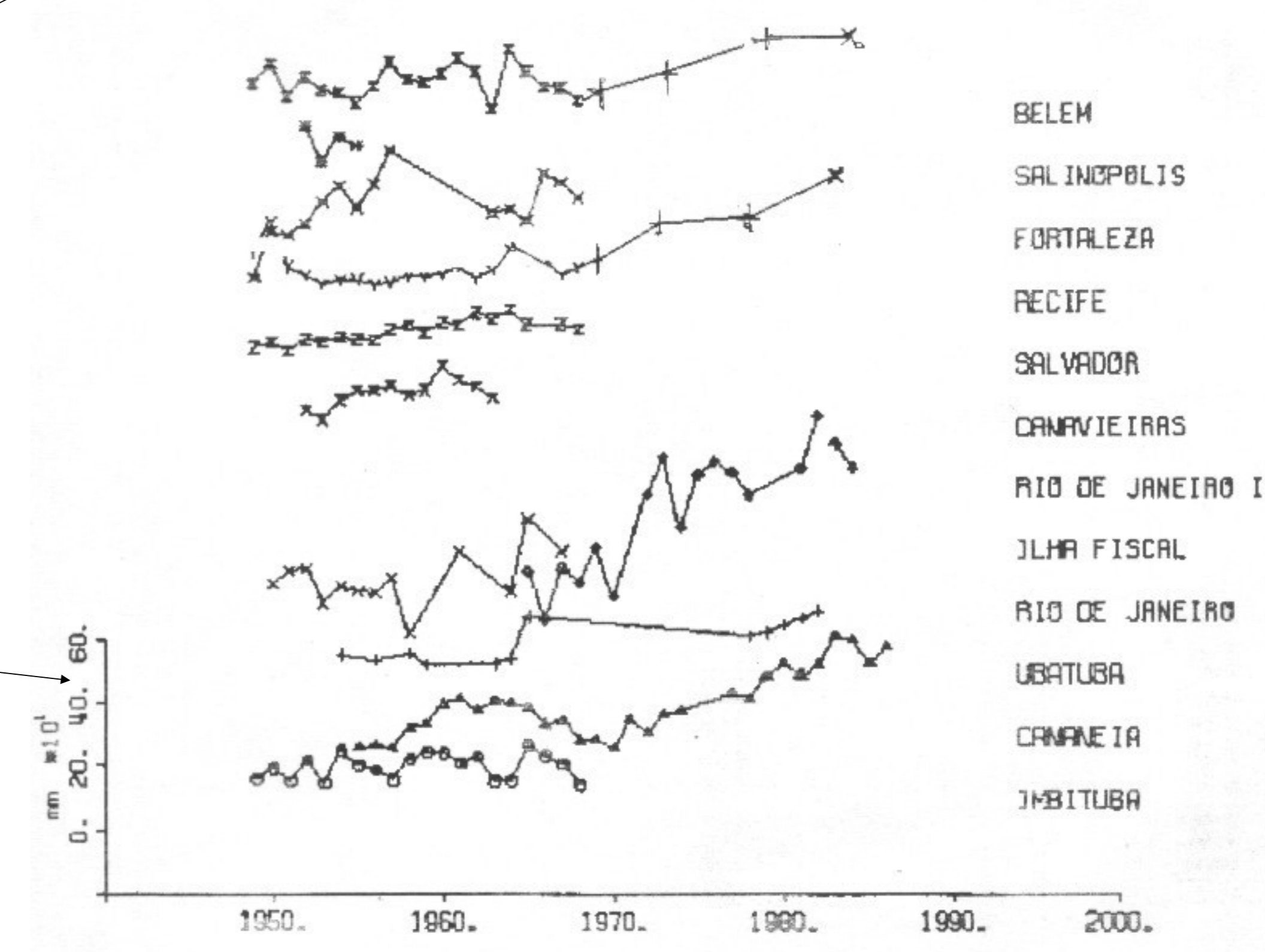
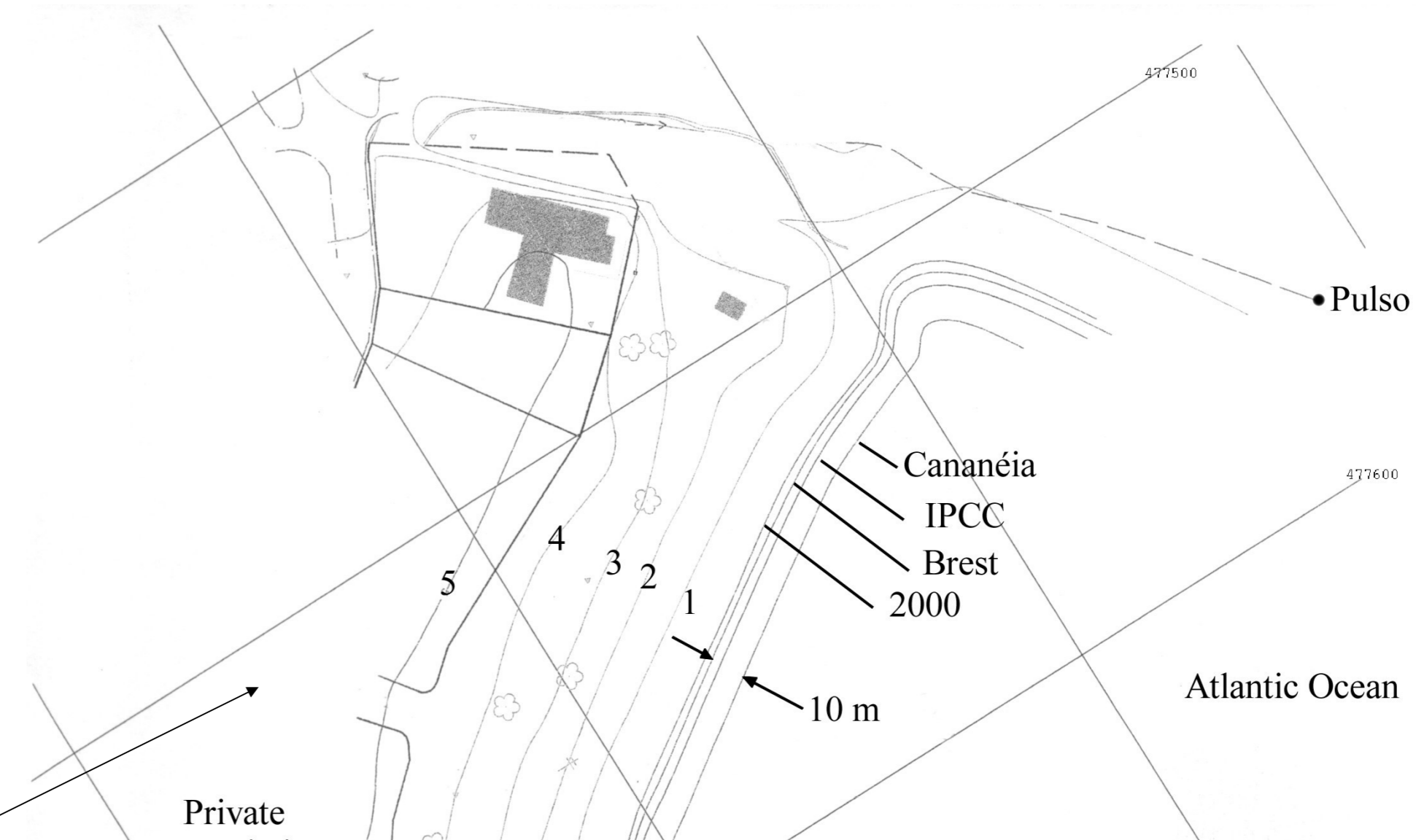


Figure 1