

**IHB File No. S3/2705**

**CIRCULAR LETTER 40/2001  
20 September 2001**

**SEA LEVEL DATA ARCHEOLOGY**

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Dear Sir,

The Bureau was recently approached by the IOC Global Sea Level Observing System (GLOSS) Group of Experts seeking assistance for their project aimed at recovering and digitizing historic tide gauge charts and tabulations, which are of potential great value to the sea level community.

Details on the background of this project, its objectives as well as contact addresses can be found in the document annexed to this Circular Letter.

Member States are kindly requested to give this project the attention it deserves and to establish direct contacts with Dr. Lesley Rickards and/or Dr. Pat Caldwell (see addresses in Annex A), if they are able to contribute to the project.

On behalf of the Directing Committee,  
Yours sincerely,

Rear Admiral Giuseppe ANGRISANO  
President

Annex A – "Data Rescue of Historic Tide Gauge Charts and Tabulations" (in English only)

### **Data Rescue of Historic Tide Gauge Charts and Tabulations**

At the 6th session of the IOC Global Sea Level Observing System (GLOSS) Group of Experts in 1999 and at the 16th session of the IOC Committee on International Oceanographic Data and Information Exchange (IODE) in 2000, the topic of data rescue of historic tide gauge data in non-computer form (charts, tabulations etc.) was discussed. These mostly paper-based data sets are of potential great value to the sea level community in a range of applications, the most obvious of which is the extension of existing sea level time series as far back as possible in order to understand more completely the timescales of sea level change.

The topic was reviewed once again most recently at the 7th session of the GLOSS Group in April 2001, and GLOSS and IODE were encouraged strongly to work together to undertake the actions described in Annex 1 of this letter. Consequently, we are contacting all relevant members of our combined address lists.

#### Tide Gauge Charts

Many agencies possess large numbers of historic tide gauge charts which are in danger of decay or disposal 'to make space'. It is essential that, for the priority sites at least (Annex 1), the charts are digitized to provide hourly (or similar) sea level values in computer form, with the resulting data sets made available to the international community and, of course, to the chart-owners.

We are sure that such potentially important charts exist for priority sites. At some sites, we know that charts exist which were digitized manually long ago, and tidal and mean sea level data were extracted (which are now in international data banks), but the hand-written tabulations were not preserved. In both cases, it is necessary to undertake new digitizations to modern standards.

Chart digitizing has historically been a labour-intensive activity. However, the availability of new scanner-based packages seems to provide the possibility to speed up the work considerably. We are presently investigating several packages.

In order to obtain a first estimate of how many such charts exist from GLOSS and other priority sites, and to make an estimate of the total effort required for their digitization, we would be grateful if you or one of your colleagues could reply to the questionnaire in Annex 2 of this letter. **Although all of the information requested is important, if some of it is not immediately accessible, then please complete and return the 'Primary Information' section of the questionnaire first, and then provide the 'Supplementary Information' at a later date.** We would be grateful for replies if possible by the end of December 2001, although please feel free to send information to us at any time thereafter if, for example, new sets of historic charts are discovered.

We shall do at least 3 things with this information:

1. We shall set up a web page accessible from the PSMSL home page (<http://www.pol.ac.uk/psmsl/>) wherein all replies will be summarized, so that everyone can assess the overall magnitude of the problem. We hope that bilateral arrangements to digitize charts might stem from making this information widely available.
2. If the information refers to a GLOSS site, we shall add the information to the GLOSS Handbook data set (see <http://www.pol.ac.uk/psmsl/programmes/gloss.info.html>).
3. From the complete set of replies, the GLOSS Group will determine priority sets of charts for processing using (limited) IOC/IODE/GLOSS resources.

In the first part of 2002, we shall undertake a review of the success of the project so far.

Tide Gauge Paper Tape, Punched Cards etc.

For information contained in punched paper tape or other formats, please reply to Dr. Rickards along the lines of Annex 2, enclosing as much background information as possible. Please also let us know if you have tide gauge data on IBM-type punched cards or other computer media which you can no longer read.

Sea Level Tabulations

Members of the GLOSS community will know (from the minutes of the GLOSS Group 7th session and from a circular email of July 2001) of the offer of the University of Hawaii Sea Level Center to computerize typed or hand-written paper tabulations of historic sea level values (e.g. hourly heights) from GLOSS and other priority sites. The person to contact to discuss the offer is Dr. Pat Caldwell (caldwell@kapau.soest.hawaii.edu).

Many thanks for your help with this important project.

Yours sincerely,

Lesley Rickards (British Oceanographic Data Centre ), GLOSS Handbook Editor  
Philip Woodworth (Permanent Service for Mean Sea Level), Chairman GLOSS Group of Experts  
Ben Searle (Australian Oceanographic Data Centre), Chairman IODE  
Syd Levitus (Ocean Climate Laboratory, WDC(Oceanography)/NODC), GODAR Project Leader

**Annex 1: Extract from the Report of the IOC Committee on International  
Oceanographic Data and Information Exchange (IODE). Sixteenth Session.  
Lisbon, Portugal, 31 Oct - 8 Nov 2000**

7.2.1. Global Oceanographic Data Archaeology and Rescue Project (GODAR)

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*Dr. L. Rickards, representing the Group of Experts on the Global Sea-Level Observing System (GE-GLOSS), reported that the GE-GLOSS had discussed the need for data archaeology of historic sea-level records to extend existing time-series and to gain access to observations which are not in digital form. Subsequently, a representative of the GE-GLOSS proposed to the IGRC that sea-level data be included in the second phase of the GODAR project.*

*The rationale of the GODAR sea-level proposal is based on the fact that in many countries there are considerable amounts of historical sea-level data in paper form, such as charts or tabulations. These need to be computerised (a) to provide electronic access (b) as a backup for data security, and (c) so that they can be subject to modern quality control and data analysis. The data can then be used for the various GLOSS-related activities described in the GLOSS Implementation Plan. The original records (e.g., charts, manuscript tabulations, etc.) would not be destroyed, as they may contain further information which is not captured by the computerised version (for example, charts digitized to hourly values might miss seiche or tsunami information) and also, in some cases, they are historic documents.*

**The Committee supported** the proposal and **recommended** that the proposed sea-level data archaeology project should be co-ordinated by the GE-GLOSS, with the GODAR Project Leader acting as advisor to the project.

**The Committee encouraged** all countries to assess their holdings of historical tide gauge data which can potentially be rescued and convey that information to the Permanent Service for Mean Sea Level (PSMSL), which will act as the contact point. Following this, the GE-GLOSS would undertake action to put countries in communication with each other and with sea-level organizations with regard to collaborative data rescue. The GLOSS and other important sites (e.g., those with long records) should be regarded as priority sites. The Committee noted that sea-level data archaeology has begun in several regions already (e.g., Europe, USA and Canada).

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## Annex 2: Questionnaire on Historic Tide Gauge Charts

We would be grateful if you could provide the following information:

<b>1. PRIMARY INFORMATION</b>	
<b>Contact Name</b> <b>Address</b>  <b>Tel/Fax/E-mail</b>	
<b>Location of the historic measurements</b> (station name, country name, if possible latitude/longitude) If possible a local map should be provided showing the location of the measurements within a port or harbour (we realise that sometimes the exact location may no longer be known).	
<b>Start and end dates of the measurements</b>	
<b>Are existing (i.e. probably later) data already available in computer form from this site?</b> If so, for what dates?	
<b>Is this site a GLOSS station, or are there existing data from this site in the PSMSL, UHSLC or other international data banks?</b> (We can enter this field if necessary from our knowledge of GLOSS, PSMSL and UHSLC)	
<b>2. SUPPLEMENTARY INFORMATION</b>	
<b>Type of charts.</b> Manufacturer of the charts. Approximate size (cm x cm or inch x inch).	
<b>Manufacturer</b> and description of the gauge itself.	
<b>Scale factor</b> (i.e. ratio of sea level in the ocean to that on the chart)	
<b>Chart replacement frequency</b> (e.g. daily, weekly)	
<b>Quality of charts</b> (e.g. Is the pen trace thin and distinct, which is good, or fat or smudged, which is bad? Is the paper deteriorating? How much high-frequency variability is there in the pen trace from waves, harbour activity or seiching).	
<b>How often were checks made on the gauge by a local observer?</b>	
<b>Is there corresponding data available from tide pole readings?</b> How frequent were they (e.g. daily, weekly) and are how are those readings recorded (e.g. in a book, marked on the chart)	
<b>Is there other detailed knowledge of the relationship between the zero of the chart readings, tide gauge zero, tide pole zero, heights of nearby benchmarks etc.?</b>	

Please provide as much as possible other background information and send replies to this questionnaire to Dr. Lesley Rickards either by email (ljr@bodc.ac.uk), fax (+44 151 652 3950) or post to:

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