IOC Circular Letter No 2572
(Available in English only)

To : Official National Coordinating Bodies for liaison with the IOC in Member States of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS)
Permanent Delegates/Observer Missions to UNESCO of IOC Member States of the ICG/NEAMTWS
National Commissions for UNESCO of IOC Member States of the ICG/NEAMTWS

Cc : Tsunami Warning Focal Points (TWFP) and Tsunami National Contacts (TNC) of the ICG/NEAMTWS
Candidate Tsunami Service Providers (CTSPs) of France, Greece, Italy and Turkey
ICG/NEAMTWS Officers

Subject : Testing offer of Inexpensive Device for Sea-Level Measurement (IDSL) developed by the Joint Research Centre (JRC) of the European Commission (EC)

The ICG/NEAMTWS at its 11th session (12–14 November 2014, Nicosia, Cyprus) acknowledged the continued support of the European Commission and JRC in capacity development, including infrastructure and research and new sea-level measurements.

At ICG/NEAMTWS-XI the JRC informed about its efforts to develop the “Inexpensive Device for Sea-Level Measurement” (IDSL) for tsunami monitoring. The first IDSL device was installed a few months ago in Imperia (Italy) in collaboration with the Italian National Institute for Environmental Protection and Research (ISPRA). As part of a pilot testing project JRC has offered to provide up to 20 IDSL devices to interested countries/institutions in NEAMTWS.

The ICG/NEAMTWS Working Group 3 (Sea-Level Data Collection and Exchange, Including Offshore Tsunami Detection and Instruments) appreciated the offer of JRC to provide new real-time sea-level stations to Member States that need of such stations, and looked ahead for tighter cooperation with JRC in providing real-time sea-level data for the NEAMTWS.

With this letter I transmit the proposal of JRC to ICG/NEAMTWS Member States and invite interested Member States to send any expression of interest for this offer.

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The annex provides details from JRC about the equipment, the offer, site requirements, installation and monthly GSM data transmission volume. More information about the equipment can also be found at: http://webcritech.jrc.ec.europa.eu/tad_server/?id=64&ndays.

Data collected with the IDSL should be made available to the Global Sea Level Observation System (GLOSS) and the IOC Sea Level Station Monitoring Facility in accordance with the IOC Oceanographic Data Exchange Policy.

Any inquiries about the present circular can be addressed to the Technical Secretary of ICG/NEAMTWS, Ms Francesca Santoro (f.santoro@unesco.org). Please send your expression of interest to reach Ms Francesca Santoro by 6 April 2015.

With the assurances of my highest consideration, I remain,

Yours sincerely,

[signed]

Vladimir Ryabinin
Executive Secretary

Enclosures: Technical Annex I – Inexpensive Device for Sea Level Measurement (IDSL)
Technical Annex II – Needs and requirements for IDSL installation
THE INEXPENSIVE DEVICE FOR SEA LEVEL MEASUREMENT (IDSL)

A new mareograph device has been designed and developed for tsunami monitoring at the Joint Research Centre of the European Commission (JRC). A first IDSL device has been installed a few months ago in Imperia (Italy) in collaboration with the Italian National Institute for Environmental Protection and Research (ISPRA). While the initial test of the IDSL is encouraging, the long term accuracy, reliability, robustness and durability of the IDL need to be tested more extensively. A pilot test project is being organized and IDSL devices are being offered for testing to interested member states/institutions that participate in the North East Atlantic, Mediterranean and connected seas Tsunami Warning and Mitigation System (NEAMTWS).

The core of the IDSL device is the Raspberry Pi, a credit-card sized computer that contains a Linux operating system and several standard components (USB, HDMI, Ethernet port, Video card, and sound card) and other busses that can easily be connected with external devices. The device therefore has a computer on which software can be installed and that can be connected to remotely for debugging or software change. The other important component is the low cost ultrasonic sensor used for the sea level measurements. Additional components are necessary in order to have an autonomous system (electrical power feed and communication).

The IDSL was designed to the following design specifications:

- High quality of the data with an error of 0.5 cm maximum (sensitivity justified by the expected error in the sea level calculations)
- Short sampling time interval, 15 s maximum (in order to have a well-defined sea level wave description over time)
- Small transmission latency, smaller than 30 s (important for small basins with short tsunami travel time)
- Low overall cost, less than 1,000 Euro
- Autonomy, at least 3 days without solar irradiation (the autonomy can be increased to 7 days with a higher cost and higher weight battery)

The IDSL has met these requirements and in some cases even surpassed them (e.g. the acquisition interval is 5 s and the maximum transmission latency 15 s).
Mounting sequence of the IDSL installed in Imperia (Italy) (courtesy of I.S.P.R.A. and Coastal Guard). In about 1 h the IDSL was operational and transmitting data to the JRC server (see web page below).

**Technical details**

The **Inexpensive Device for Sea Level measurement** is equipped with:

- Ultrasonic sensor, accuracy 1-5 mm, depending on range (5 or 10 m)
- Solar Panel 100 kW
- One battery in the main box (7.2 Ah) and an additional battery back of 36 Ah for a total of 43.2 Ah, for an autonomy of 3-4 days, depending on the installation latitude
- Voltage regulator
- Raspberry Pi B+ for data logging and transmission
- GSM transmitter

The device transmits data continuously to the server with an interval that can be set from 5 s to 1 min and the data are stored in the database and visible online. The software also includes tsunami detection algorithms for the identification of anomalous waves.

A web site is available to visualize, analyse and download the data as soon as they are stored.

It is possible to access the Raspberry computer remotely through a VPN connection and thus have the possibility to modify settings or change the data logger programme.

No special requirement for the installation is necessary except:
- A vertical wall on which to fix the supporting pole
- Good insulation (no shadow by buildings)
- Good GSM 3G network

Above is the web site that shows all the parameters measured (sea level, battery voltage, latency) and the derived parameters (short and long range forecast, alert level, alert signal and RMS of the signal (wave indicator)).
Inexpensive Device for Sea Level Measurement (IDSL)
Requirements and conditions for donation and installation

At the 11th session of the ICG/NEAMTWS (12-14 November 2014, Nicosia, Cyprus) the Joint Research Centre of the European Commission, in the framework of the Administrative Arrangements in place with DG-ECHO, proposed to provide up to 20 experimental sea level measuring devices to interested countries/institutions in the NE Atlantic, Mediterranean and Black Sea region.

The following outlines the requirements and conditions for countries/institutions that would like to take advantage of the offer of one or more of these IDSL devices and the associated installation:

1. Transportation and equipment costs are funded by the European Commission and include all the necessary components (solar panels, GSM device, radar sensor, data logger, batteries etc.) to have an autonomous sea level measurement station.

2. Subject to the availability of funds, personnel and other resources as well as to the applicable laws and regulations, the JRC intends to be present during the installation. Nevertheless, the installation in general can be done by the requesting country/institution on its own and does not require specialized support.

3. The devices provided and installation modalities are similar to those described in the IDSL leaflet. The JRC reserves the right, at any time, to modify the features described therein. Either design modifications to the installation plan (even minor ones) or any special requests need to be agreed with/approved by the JRC.

4. Observations will be made available in accordance with the IOC Oceanographic Data Exchange Policy.

5. The receiving institution will
   a. Provide support for the physical installation (in general 1 or 2 hours) to drill the walls to attach the pole supports
   b. Provide the SIM card to cover data transmission of up to 20 Gbytes/month

Interested countries/institutions are kindly asked to provide the following information and return to alessandro.annunziato@jrc.ec.europa.eu

<table>
<thead>
<tr>
<th>Number of devices desired</th>
<th>Location(s) of installation</th>
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<tbody>
<tr>
<td>Presence of electrical power</td>
<td>Yes/No/Yes but not usable</td>
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<tr>
<td>Presence of fixed LAN</td>
<td>Yes/No/Yes but not usable</td>
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<tr>
<td>Presence of other sea level measuring devices in the same location</td>
<td>If yes, please indicate which and if present in the IOC Sea Level Station Monitoring Facility</td>
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<td>Possible installation date</td>
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<td>Contact person for installation</td>
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**Disclaimer**
IDSL device is a no large-scale tested prototype. The present document does not constitute and will not give rise to any legally binding obligation by the requesting country/institution. More in particular, the acceptance of the installation of the device/devices implies that it/they is/are experimental in nature and aimed at collecting information on the capability and durability of the device itself. The JRC, IOC/UNESCO and NEAMTWS will neither assume responsibility on the correct and continuous functioning of the device, nor will guarantee any long-term maintenance of the device.