

**Recommendations for CMEMS on standard NetCdf format for
tide gauge data:**

EuroGOOS Tide Gauge Task Team

(In collaboration with GLOSS and CMEMS representatives)

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1. Introduction

The EuroGOOS Tide Gauge Task Team has discussed with CMEMS and GLOSS (Global Sea Level Observing System) representatives about adoption of common NetCdf standards for sea level data from tide gauges.

At this moment, **SLEV** is the variable name used for these data in CMEMS, as defined in the P09 set (Medatlas vocabulary: <http://vocab.nerc.ac.uk/collection/P09/current/>, the one they use for other variables). The actual definition of **SLEV** in P09 is: “The elevation of the sea surface relative to a known but unspecified datum” and refers to “Observed sea level”. This is considered in this catalogue to be the same as **ASLVZZ01** from P01 set (vocabulary <http://vocab.nerc.ac.uk/collection/P01/current/ASLVZZ01/>) and related to the broader **ASLV** label from P02 set (SeaDataNet vocabulary).

GLOSS adopted years ago the variable name **ASLV** from the P02 set (SeaDataNet vocabulary; definition: “Measurements and predictions of the displacement of the water column surface from a fixed, stable reference”, <http://vocab.nerc.ac.uk/collection/P02/current/ASLV/>). This set includes many additional names for sea level data from tide gauges, including pressure data, tidal predictions, etc. It would be difficult and not adequate to recommend therefore **SLEV** for GLOSS purposes. On the other hand, the administrators of the parameter vocabularies consider P09 just maintained for historical reasons and recommend new users to use P01 (Liz Bradshaw communication).

On the long term, both communities GLOSS and CMEMS should use the same variable names for sea level data from tide gauges. Although a convergence in the future to GLOSS standards

in CMEMS would be welcome, this seems not feasible at this moment. This is not critical, however, provided the link between both variable names is indicated.

2. Recommendations for CMEMS In-Situ Tac

The EuroGOOS Tide Gauge Task Team has agreed in the following recommendations for CMEMS:

I. Variable name: SLEV can be maintained, with the following modifications in the NetCdf Conventions (requirement by CMEMS In-Situ TAC's at the end of 2016):

- *Variable name:* SLEV (P09 Medatlas vocabulary)
- *CF Standard Name:* water_surface_height_above_datum
- *Long Name:* Water surface height above a specific datum

“sea surface height” is proposed to be replaced by “water surface height” to allow for data from tide gauges in lakes or rivers. The mention to “Observed” is avoided to allow the same variable name to be used in other catalogues. On the other hand, as this is part of the “observations” catalogue of CMEMS, this word is not needed.

II. New mandatory parameter/variable attributes for SLEV:

Several difficulties encountered recently by users of tide gauge data in CMEMS reveal the need of defining the following important mandatory attributes for this parameter:

- *time_sampling*: integer in minutes, to allow for clear and fast identification of the sampling in the time series (typically: 5, 6, 10, 15, 60 min, in principle depending on the data provider).
- *sea_level_datum*: description of the reference or datum of sea level data: chart datum, geodetic datum, etc. Already implemented in CMEMS as a mandatory global attribute, we propose this to become a parameter attribute.
- *processing_method*: brief description of the data processing method: “instantaneous values”, “filtered values”, “average”, etc. If an *url* address with a more detailed explanation is available, it can be inserted here.

Additionally, the following optional attributes are recommended, when available:

- *TGBM_name*: name and description of the Tide Gauge Bench Mark
- *TGBM_sea_level_datum*: height (mm) of TGBM above sea level datum
- *co_location_with_GNSS*: Distance(km)/No/Unknown. Important information requested by Mercator to the In-Situ Tacs. The idea is to provide an easy way to detect those tide gauges with a GNSS station nearby. Additional information or “url” address, if available, could be added in the Comment attribute.
- *TGBM_ellipsoidal_height_estimate*: height (mm) of TGBM above estimate of ellipsoidal height available in SONEL¹.
- *vertical_land_movement_estimate*: even if the tide gauge is co-located with a GNSS station, this estimate may not be available yet. The content of this attribute

could be unknown or the trend, if available in SONEL: *trend(mm/year) - period (initial to final year)/unknown*.

- *GNSS_campaign: Yes/No*. If there is information about availability of a GNSS campaign from the station, it can be indicated here with a link to the source of these data in the Comment attribute.

The parameter attribute *Comment* is suggested to be used for providing additional relevant information about the history of the station, or to include an “url” link to more detailed metadata, when available.

¹The attributes *vertical_land_movement_estimate* and *ellipsoidal_height_estimate* will be considered available if they are already provided by the official GLOSS data bank for GNSS data, SONEL; a link will then be included in the parameter attribute *Comment* to SONEL web site (www.sonel.org) in this case, where information about dates of computation and methods, period of data, etc, will be available. The reason for not including solutions from other institutions here is to avoid heterogeneous data periods, reference frame, etc.

IMPORTANT: an attribute is a constant property of a variable in a NetCdf file; therefore, its definition **implies the need of homogeneous sea level time series within the file**, e.g.: same sea level datum and same time sampling. We found out, however, that several tide gauge stations have different time samplings within the same historical files available in CMEMS (REP product). It should be guaranteed therefore that this does not happen in the future. The same could apply (without notice for the users) to the sea level datum.

III. Other Recommendations for historical data (REP products):

- Storage of original high frequency data (5, 6, 10 min, etc) and hourly data products: Depending on the application, these different products may be needed. Particularly, the altimetry community have requested hourly tide gauge data to be a final product of CMEMS. After a long discussion within the Task Team and with CMEMS In-Situ TAC representatives, we consider the best way of dealing with this would be storing the different sampling time series in different files, following the approach of the CMEMS MFC's (Marine Forecasting Centers). The variable name will be the same (SLEV) and the sampling will be reflected in the name of the file (to be decided and defined within CMEMS).
- Station metadata: this is a critical point that it is being discussed within GLOSS and the PSMSL (Permanent Service for Mean Sea Level). We need to explore new ways of storing sufficiently detailed metadata for each station, including definition of “station”, history of different locations and sensor types, datums, bench-marks, levelling information, maintenance, malfunctions, etc. A good metadata structure should be defined to deal with all this information. This could be done in the future following the work started within GLOSS and the PSMSL.