

ArcTiCA: Arctic Tidal Constituent Atlas

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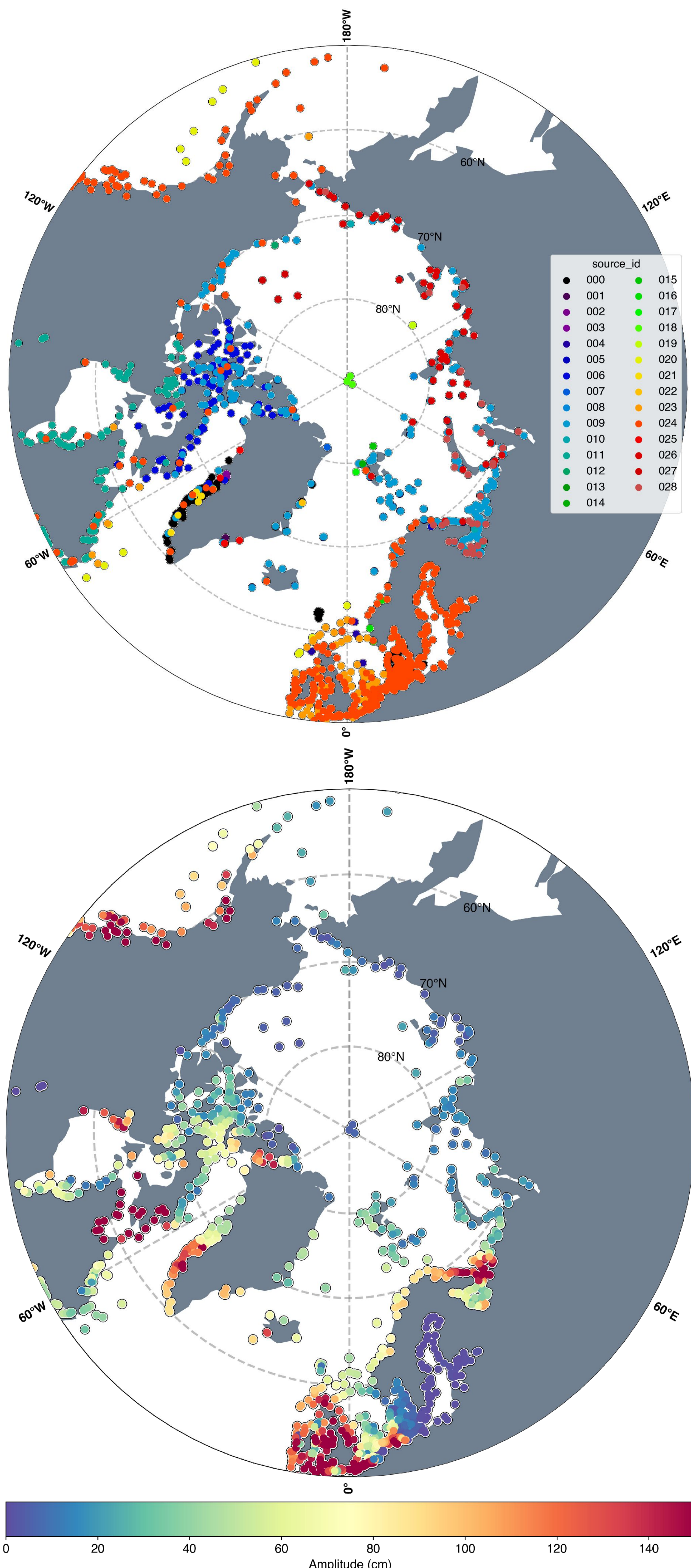
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Background and Summary

- In the Arctic Ocean, tides influence the distribution of sea ice, cause the formation of leads within pack ice and play an important role in mixing and stirring of coastal and deep Arctic Ocean waters.
- Current public global tide gauge datasets, e.g. TICON-3 (Hart-Davis et al 2022), contain limited measurements in the Arctic region with only 21 gauges being found above 70°N.
- As tidal model developments move towards the Arctic, in-situ measurements become increasingly crucial for evaluation of model developments.
- For tidal currents, Baumann et al. (2020) produced an Arctic tidal current atlas of mooring observations for validating Arctic circulation models.
- As a complement to Baumann et al. (2020) but with the focus on tidal elevation, we present the results of a concerted effort to build a documented, common source of tidal constituents in the Arctic.

Key Facts of the Dataset

- The resultant dataset contains 914 sites above 60°N and 399 above 70°N.
- The dataset contains measurements from ocean bottom pressure sensors, tide gauges and GNSS-R, and contains a total of 29 different data sources.
- In some cases tidal constituents were directly provided by the source; however, when the source provided a time series of ocean bottom pressure or sea level, the methods described in Pawlowicz et al. (2002) were used to be consistent and allow replicability of the dataset.
- The amplitude and phase of tidal constituents are provided for varying number of constituents depending on the source of the data or the time series length.
- Within our dataset, a data origin flag and an expert opinion flag are provided to simplify use of the dataset by users in a variety of applications.
- All appropriate metadata is provided where available to further assist users in determining the applicability of the data for particular applications.

Availability:

Data: Hart-Davis M., Howard S., Ray R., Andersen O., Padman L., Nilsen F., Dettmering D.: Arctic Tidal Constituent Atlas (ArcTiCA) : A database of tide elevation constituents for the Arctic region from 1800 through present day. Arctic Data Center. <https://doi.org/10.18739/A2D795C4N>

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Figure. The distribution of all the data sources used in the creation of this dataset (top) and the amplitudes of the M2 tidal constituent as provided within the dataset (bottom).

References

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- Hart-Davis, M.G., Dettmering, D., Seitz, F. 2022. TICON-3: Tidal Constants based on GESLA-3 sea-level records from globally distributed tide gauges including gauge type information (data). PANGAEA, <https://doi.pangaea.de/10.1594/PANGAEA.951610>
- Pawlowicz, R., Beardsley, B. and Lentz, S., 2002. Classical tidal harmonic analysis including error estimates in MATLAB using T_TIDE. *Computers & Geosciences*, 28(8), pp.929-937, [https://doi.org/10.1016/S0098-3004\(02\)00013-4](https://doi.org/10.1016/S0098-3004(02)00013-4)