EGU24-8558, updated on 17 May 2024
https://doi.org/10.5194/egusphere-egu24-8558
EGU General Assembly 2024

Assessing the potential of tidal and ocean current energy for remote Arctic communities

David C. Finger and Haraldur Audunsson
Reykjavik University, Department Engineering, Reykjavík, Iceland (fingerd@gmx.net)

Tidal and ocean current energy represent continuous and reliable renewable sources that can offer valuable electricity to remote communities located near ocean shores. Ocean currents result from various factors such as tidal forces, wind shear at the water surface, temperature gradients due to inflow from melting water, salinity gradients caused by incoming freshwater, the Coriolis effect, and underwater topography. In the Faeroe Islands, ocean currents have been harnessed to produce power exceeding 1 MW (https://minesto.com/), providing an essential energy source for the ongoing energy transition.

Especially in the Arctic, temperature and salinity gradients can enhance water velocity within a stratified water column in coastal areas. Therefore, comprehensive monitoring, accounting for the vertical stratification of the water column, becomes imperative to accurately assess the full potential of ocean currents. To accomplish this, we intend to employ an Acoustic Doppler Current Profiler (ADCP) (Xylem, Inc, 2015) to evaluate the three-dimensional velocity field at various locations in Iceland, aiming to comprehend the complete potential of ocean current energy.

We will start our investigation with preliminary monitoring in Fossvogur, a two-kilometer-long fjord situated in front of Reykjavik University in Reykjavik, Iceland. We will combine in-situ ADCP data with remotely sensed surface temperature and vertical CTD proofing of the water column. Once our data collection and processing methods are standardized, we plan to extend our approach to locations with stronger ocean currents, such as Hvammsfjördur just south of the Wastfjords. Our initial findings suggest that tidal currents, temperature and salinity gradients, and wind shear significantly contribute to increasing ocean currents, challenging the assumption that the energy potential of these currents might have been underestimated in the past. This revelation could substantially aid in the energy transition of remote coastal communities by providing them with clean, cost-efficient, and environmentally friendly energy sources.

Moreover, our methodology holds promise for application in any coastal region, potentially offering a renewable energy solution for various coastal communities.