

**Observation of atmospheric and oceanic dynamics using ocean-bottom distributed acoustic sensing**

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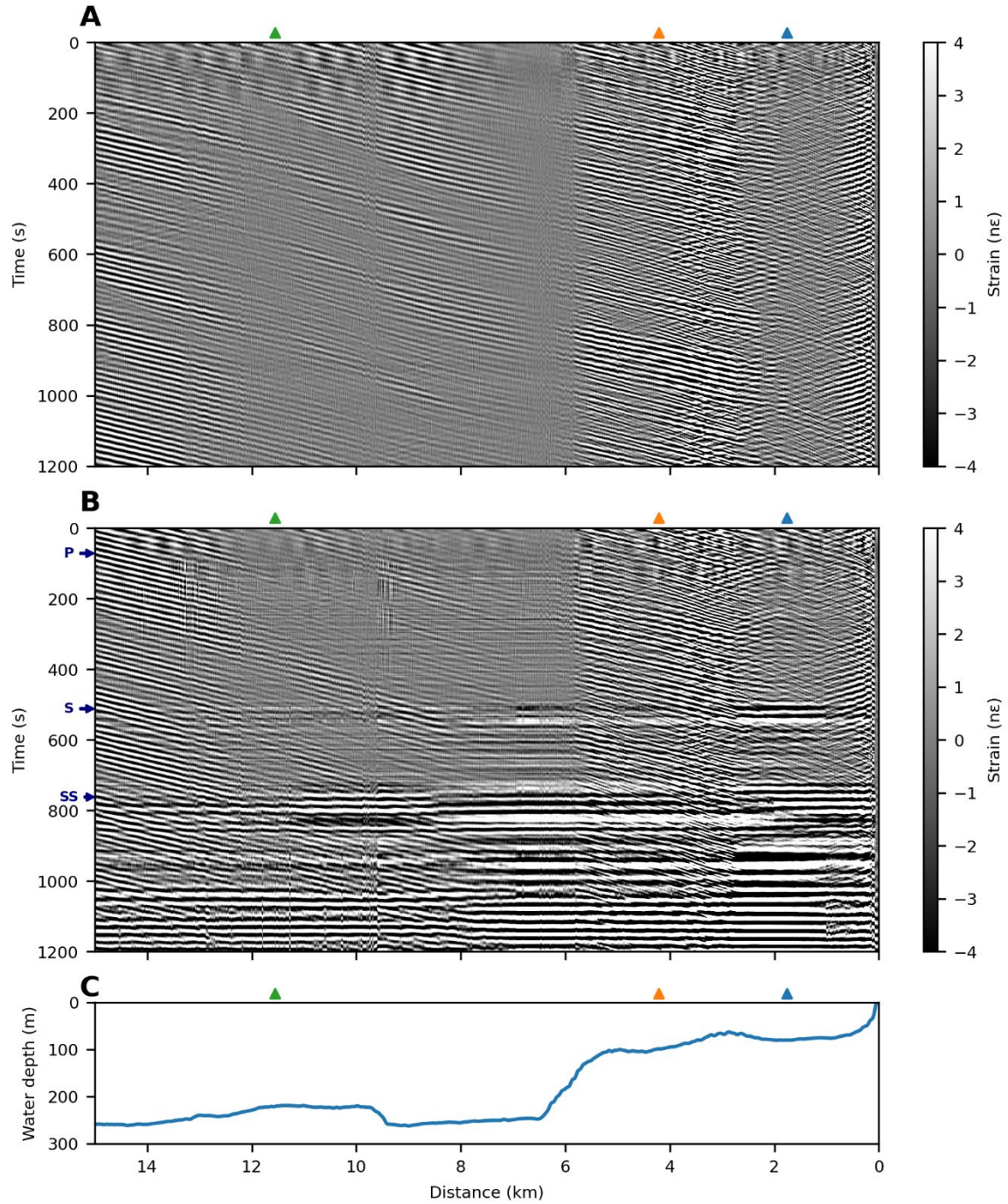
Figures S1 to S3

**Additional Supporting Information (Files uploaded separately)**

None

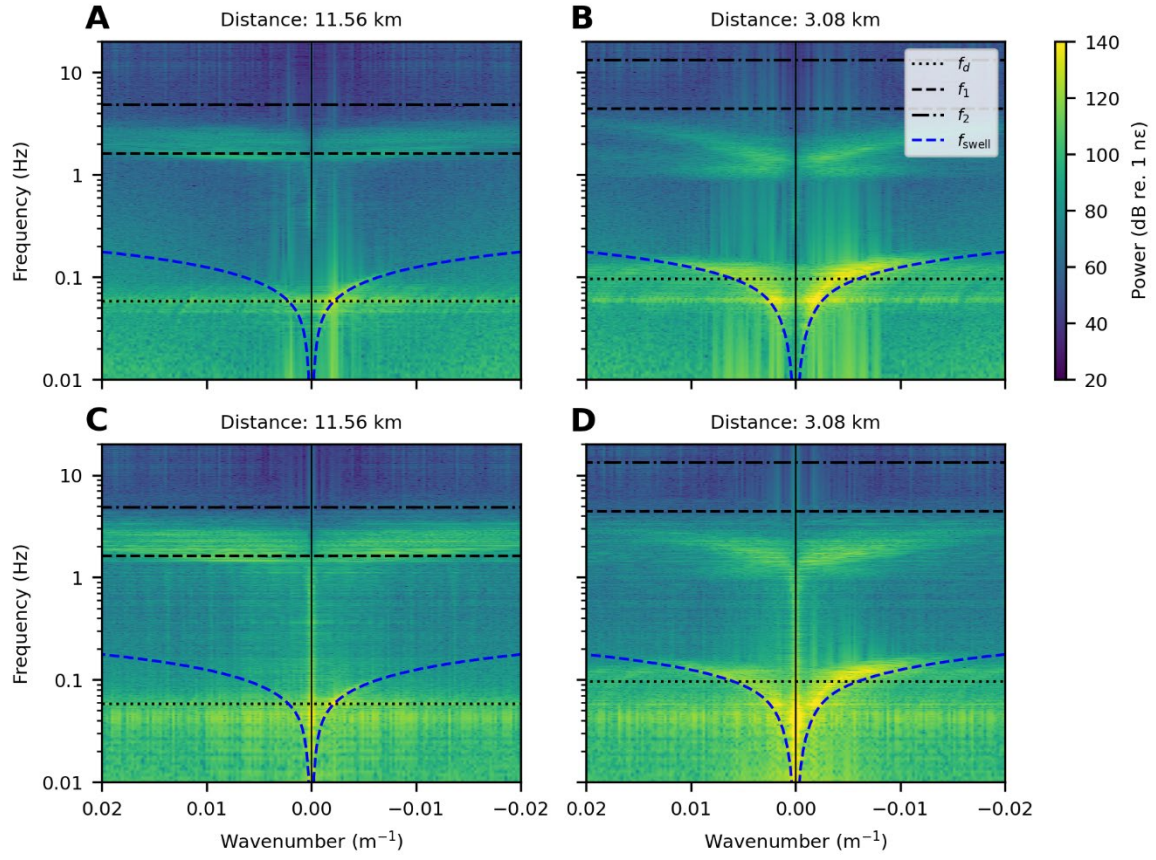
**Introduction**

The supporting information comprises the figures illustrating the data profiles and their additional spectral analyses to support the discussion in the manuscript.



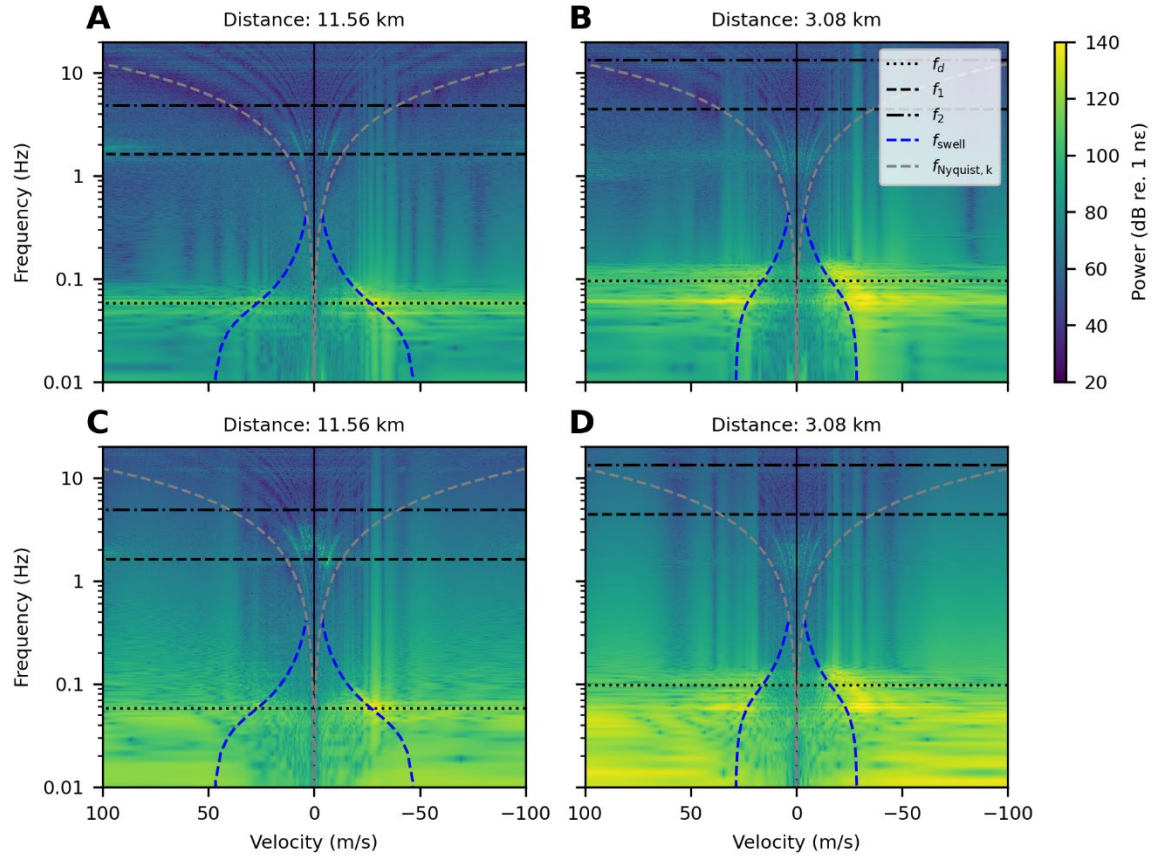
**Figure S1. DAS strain data filtered to 0.005–20 Hz. A** The recording profile from 2020-07-22T06:00:02Z without strong seismic energy from known earthquake corresponding to the spectra in Figures 2A & 2B. **B** The recording profile from 2020-07-22T06:20:02Z with seismic energy (P-, S- and SS-waves arriving at 72, 512 and 762 s, respectively) from the 2020-07-22  $M_{ww}$  7.8 earthquake on the Alaska Peninsula corresponding to the

spectra in Figures 2C & 2D. **C** The water depth profile. The colored triangles mark the locations associated with the spectra shown in Figure 2.



**Figure S2. Frequency-wavenumber spectra of DAS strain data.** **A & B** The power spectra in the  $f$ - $k$  domain around two channels from the DAS recording profile from 2020-07-22T06:00:02Z without strong seismic energy from known earthquake corresponding to the data in Figure S1A. **C & D** The power spectra in the  $f$ - $k$  domain around the same channels as in A & B from the DAS recording profile from 2020-07-22T06:20:02Z with seismic energy (P-, S- and SS-waves) from the 2020-07-22  $M_{ww}$  7.8 earthquake on the Alaska Peninsula corresponding to the data in Figure S1B. All the  $f$ - $k$  spectra are computed over 1001 recording channels (2 km radius) around the selected locations. The wavenumber is based on the distance along the fiber-optic cable from the shore in Longyearbyen—positive wavenumber for waves propagating to the ocean, and negative wavenumber for waves propagating toward the shore.





**Figure S3. Frequency-velocity spectra of DAS strain data.** **A & B** The power spectra in the  $f$ - $v$  domain around two channels from the DAS recording profile from 2020-07-22T06:00:02Z without strong seismic energy from known earthquake corresponding to the data in Figure S1A. **C & D** The power spectra in the  $f$ - $v$  domain around the same channels as in A & B from the DAS recording profile from 2020-07-22T06:20:02Z with seismic energy (P-, S- and SS-waves) from the 2020-07-22  $M_{ww}$  7.8 earthquake on the Alaska Peninsula corresponding to the data in Figure S1B. All the  $f$ - $v$  spectra are computed over 1001 recording channels (2 km radius) around the selected locations. Positive velocity corresponds to the wave propagation to the ocean, whereas negative velocity corresponds to the wave propagation toward the shore in Longyearbyen, where the DAS array begins. The gray dashed lines are the limits of spatial Nyquist sampling beyond which aliasing artifacts are shown ( $f_{Nyquist,k} = vk_{Nyquist}$ , where  $k_{Nyquist} = 1/(2 \Delta x)$ ).