

# Colloquium Talk

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## Wind-forced seasonal exchange between marginal seas and the open ocean

Wednesday, April 26, 2023

at 15:15 h

ESI, Boltzmann Lecture Hall and online via Zoom meeting

**Abstract:** The circulation within marginal seas subject to periodic winds, and their exchange with the open ocean, are explored using idealized numerical models and theory. This is motivated by the strong seasonal cycle in winds over the Nordic Seas and the exchange with the subpolar North Atlantic Ocean through the Denmark Strait and Faroe Bank Channel. Two distinct regimes are identified: an interior with closed f/h contours and a shallow shelf region that connects to the open ocean. The interior develops a strong oscillating along-topography circulation with weaker ageostrophic radial flows. The relative importance of the bottom Ekman layer and interior ageostrophic flows depends only on  $\omega h/Cd$ , where  $\omega$  is the forcing frequency,  $h$  is the bottom depth, and  $Cd$  is a linear bottom drag coefficient. The dynamics on the shelf are controlled by the frictional decay of coastal waves over an along-shelf scale  $Ly = f_0 L_s H_s / Cd$ , where  $f_0$  is the Coriolis parameter, and  $L_s$  and  $H_s$  are the shelf width and depth. For  $Ly$  much less than the perimeter of the basin, the surface Ekman transport is provided primarily by overturning within the marginal sea and there is little exchange with the open ocean. For  $Ly$  on the order of the basin perimeter or larger, most of the Ekman transport is provided from outside the marginal sea with an opposite exchange through the deep part of the strait. This demonstrates a direct connection between the dynamics of coastal waves on the shelf and the exchange of deep waters through the strait, some of which is derived from below sill depth.

A. Constantin, D. Dritschel, N. Paldor  
Zoom coordinates: <https://univieenna.zoom.us/>

Meeting ID: 663 0694 7737  
Passcode: hkmQPT

April 20, 2023