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## Key Points

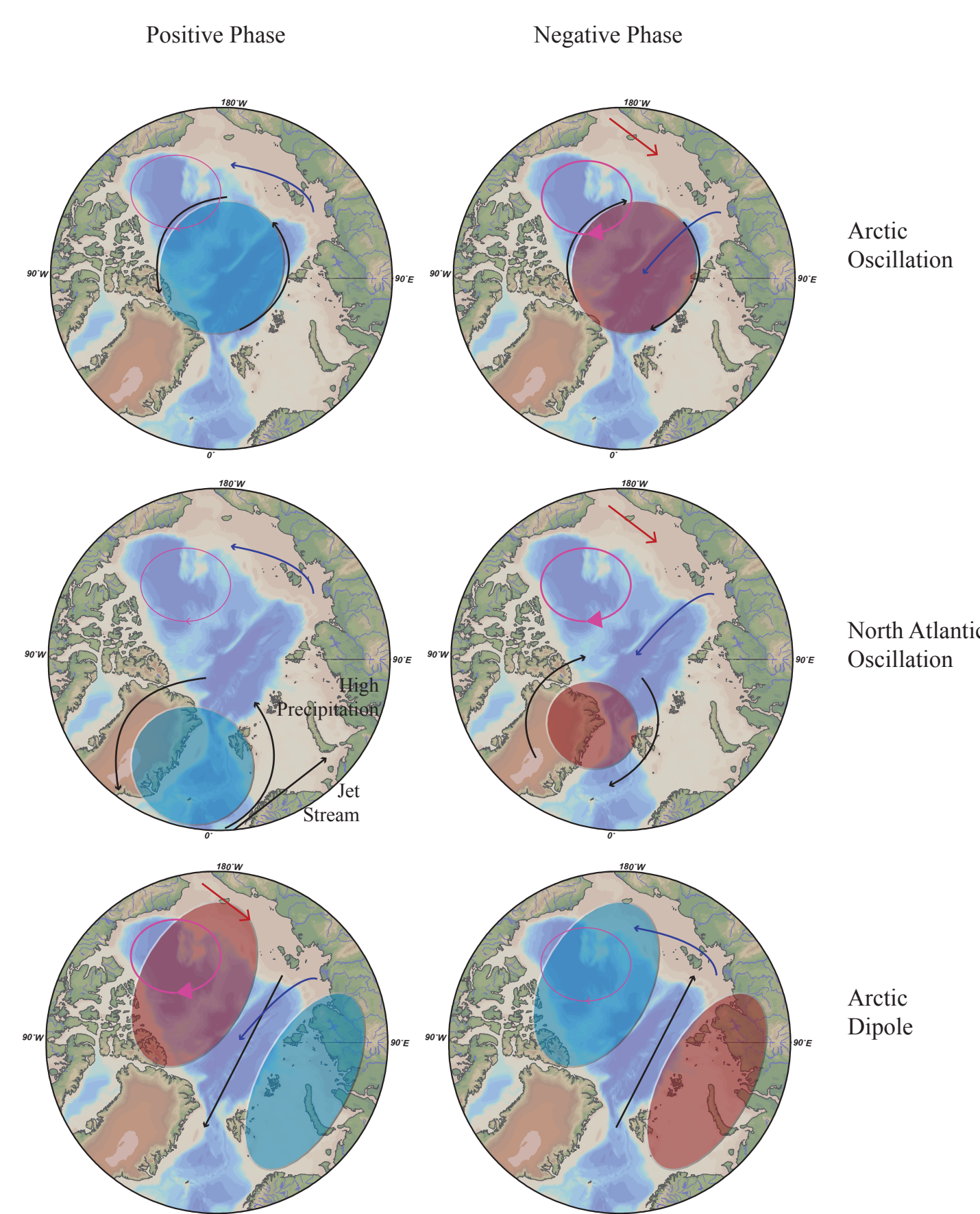
We highlight a link between the Arctic Dipole anomaly and river water content in the Laptev Sea

The Laptev Sea river water variation might be linked to the Arctic-wide freshwater content

The Laptev Sea could contribute up to 20% of the Arctic-wide freshening

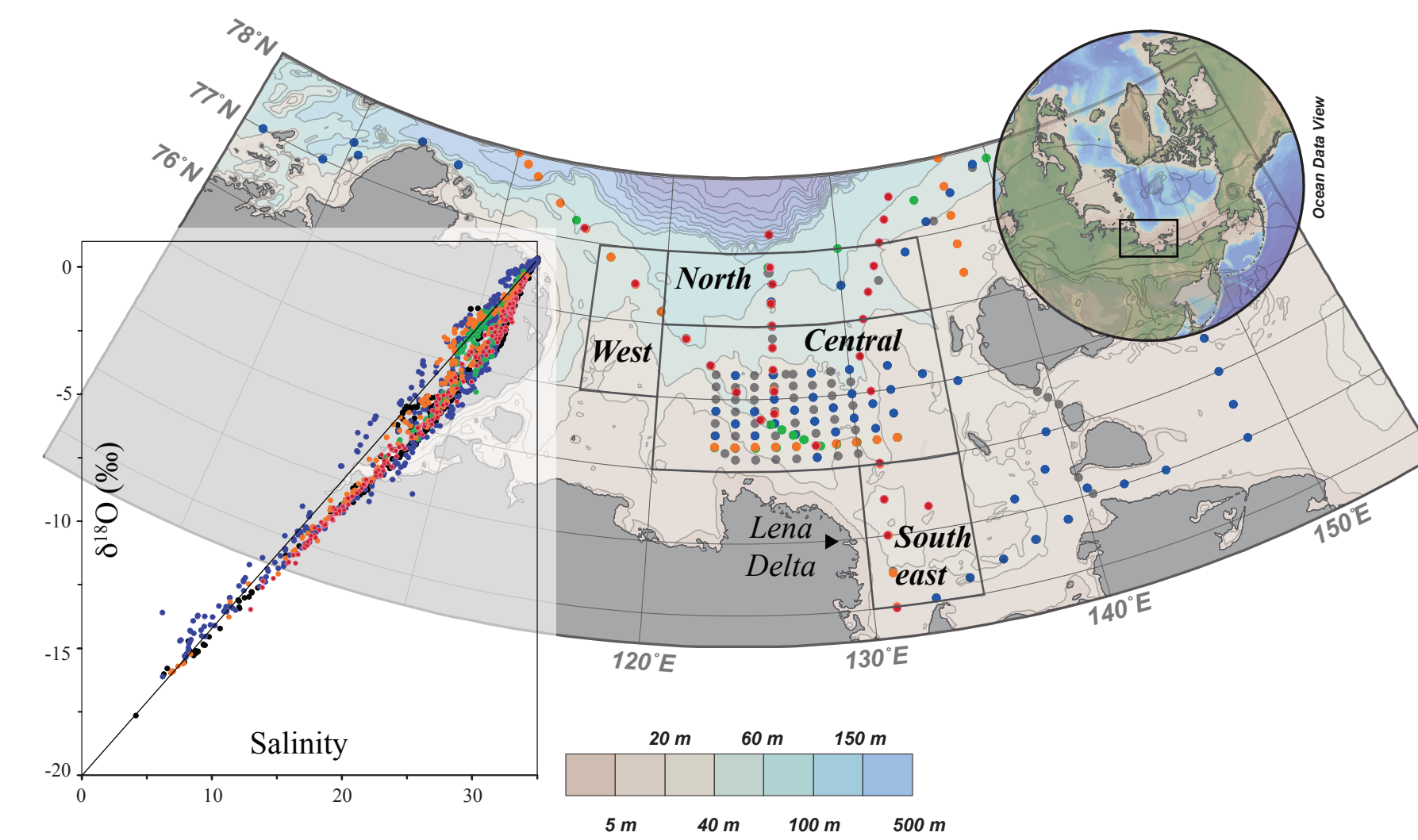
## Abstract

Five years of oxygen isotope and hydrological survey reveal interannual variations in the inventory and distribution of river water over the Laptev Sea. Our results suggest that the Arctic Dipole Anomaly might connect the Laptev Sea river water inventory and the global Arctic freshwater inventory.



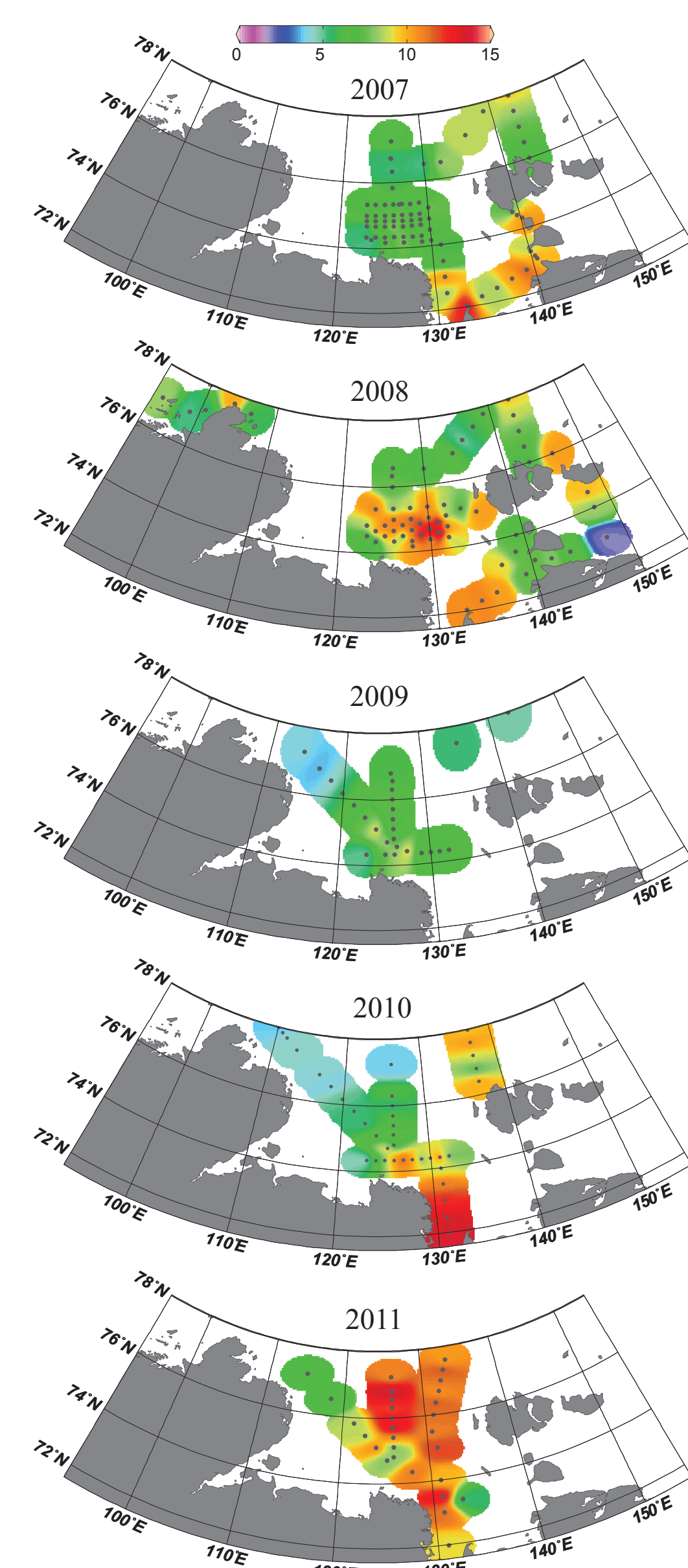
## 1. Pan-Arctic atmospheric features and their potential effect on the Laptev Sea river water export

Effect of positive and negative phases of Arctic Oscillation, North Atlantic Oscillation and Arctic Dipole on the wind anomaly (black arrows), the Beaufort Gyre strength (pink thick/thin arrow), Pacific water inflow (red arrow) and the export of Laptev Sea river water (blue arrow). Blue zones represent low-pressure anomaly and red zones represent high-pressure anomaly [inspired from : Steele and Ermold, 2004; Steele et al., 2004; Wang et al., 2009].



## 2. Oxygen isotope and salinity as a tool for water masses identification

Map of the Laptev Sea with sampling stations along with the salinity versus  $\delta^{18}\text{O}$  plot for year 2007 (Black), 2008 (Blue), 2009 (Green), 2010 (Orange) and 2011 (Red). The black line in the plot represents the mixing line between the river and seawater end-members. Rectangles on the map represent the interpolation zones used to calculate the river water inventory.

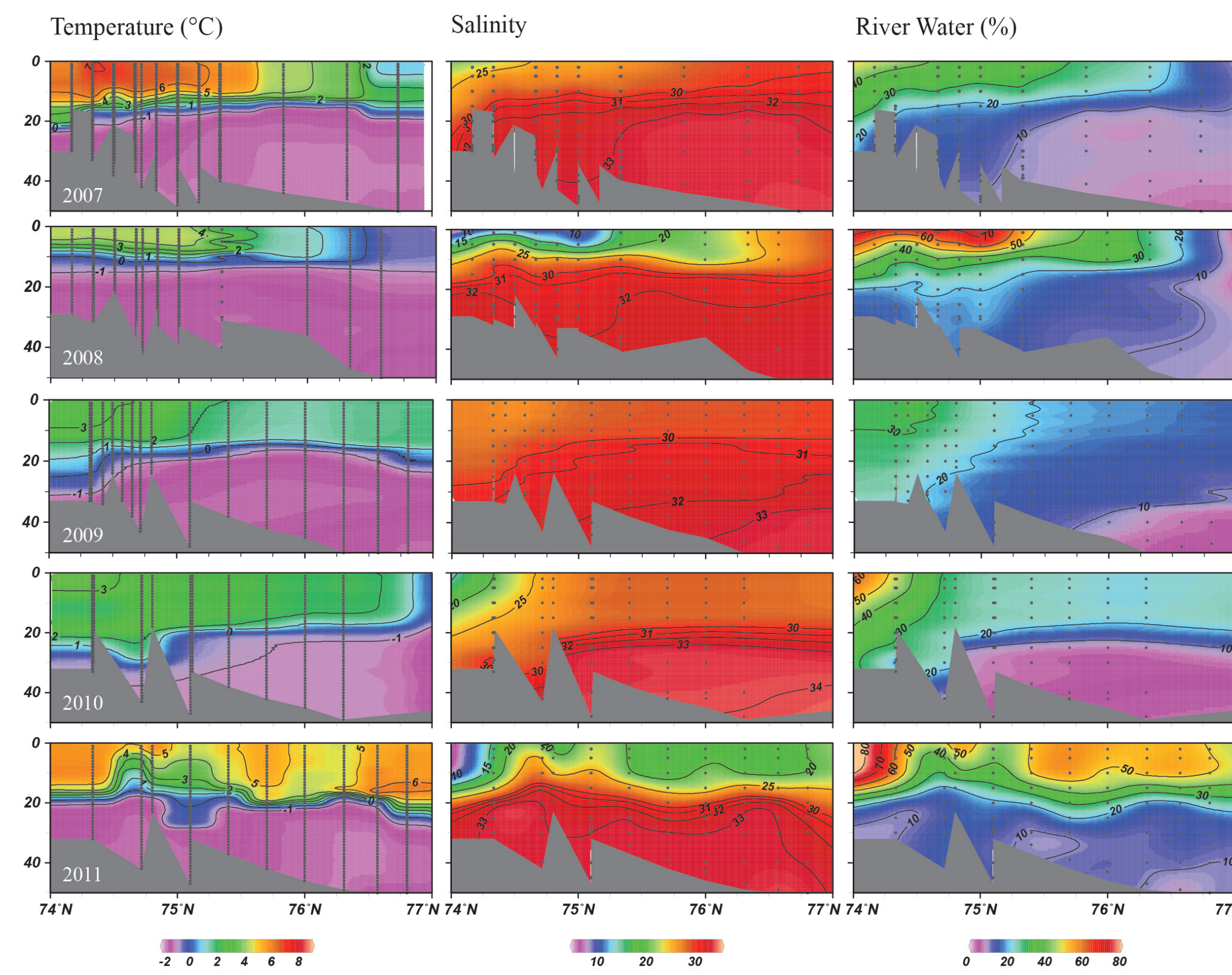


## 3. River water thickness (m) inventory for summer 2007 to 2011

Two distinct patterns are observed in our record:

- 2007, 2009, 2010: Low river water content in the central and northern part of the Laptev Sea, high content within the southeastern
- 2008 and 2011: Very high river water content in the central and northern part of the Laptev Sea

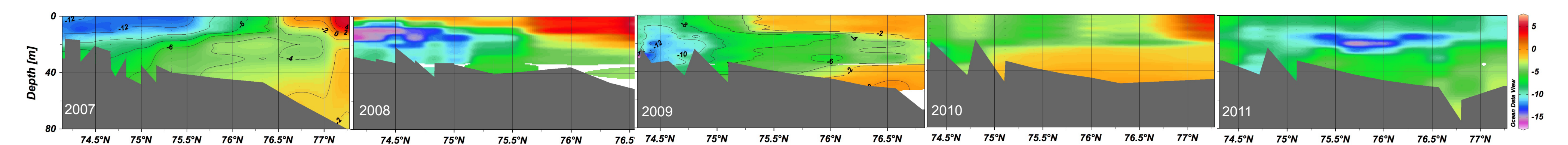
Similar features can be seen in the river water depth distribution profile (fig 4)



## 4. River water depth distribution profile

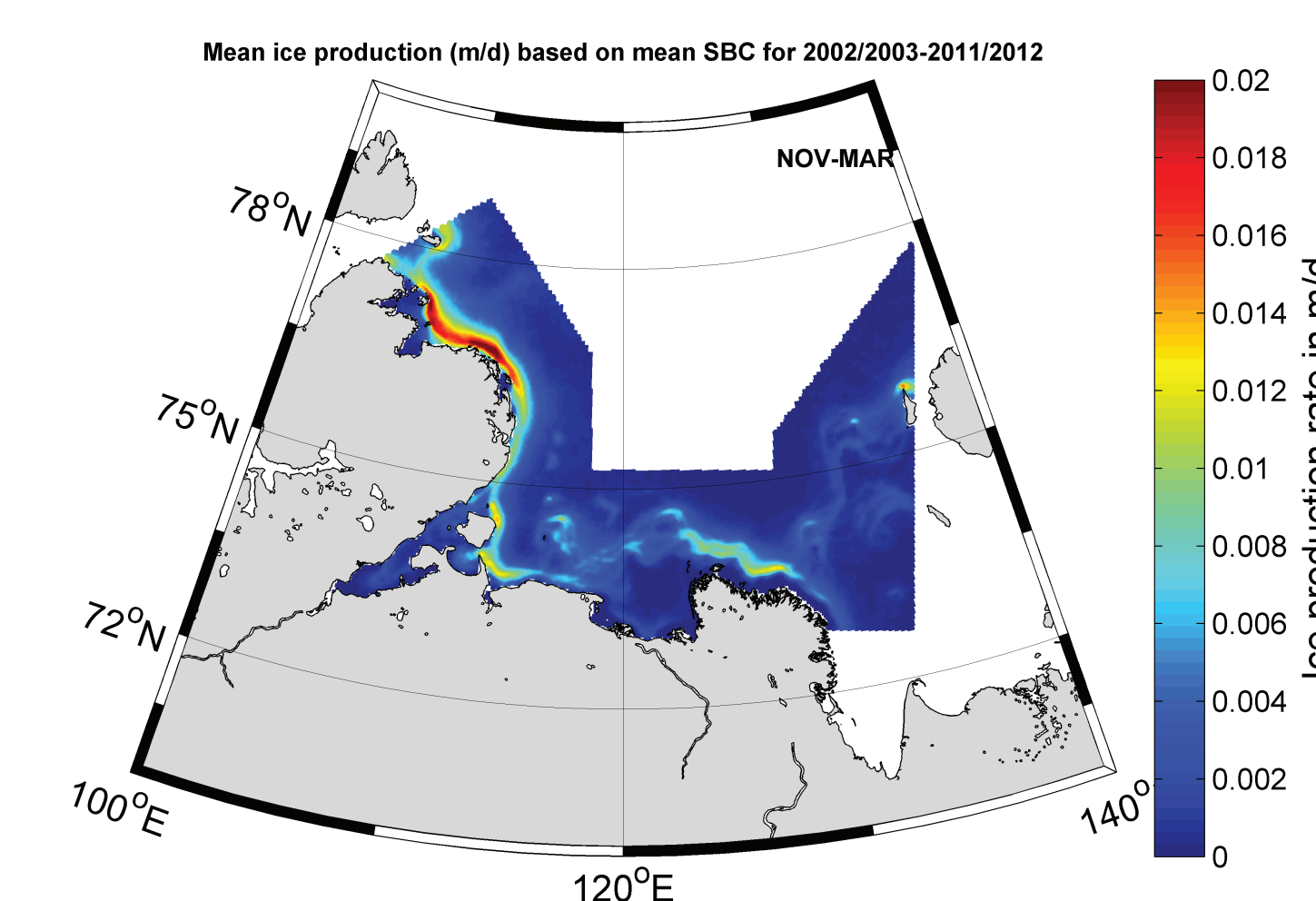
The temperature (from CTD measurement), salinity (from sampled bottle) and river water (from sampled bottle) fraction profile against depth (m) in the central Laptev Sea (74-77°N along the 126°E meridian, represented by the black line on the map) for 2007 to 2011. Dots represent each sample taken

*Take home message: The Laptev Sea river inventory was influenced by the recent strengthening of the Arctic Dipole (2007-2011). This change might contribute (up to 20%) to the observed freshening of the Arctic Ocean.*



## 6. Brine depth distribution profile (same transect as the river water)

The brine distribution is characterized by strong annual variability, but varies differently than the river water. So different forcing(s) is driving its distribution and inventory.



## 7. Polynyas activity

The brine inventory is independent from the annual variation in polynyas-derived sea-ice production (figure provided by A. Preusser, Uni. Trier)