Interannual variations of freshwater content in Hornsund

September 29, 2014

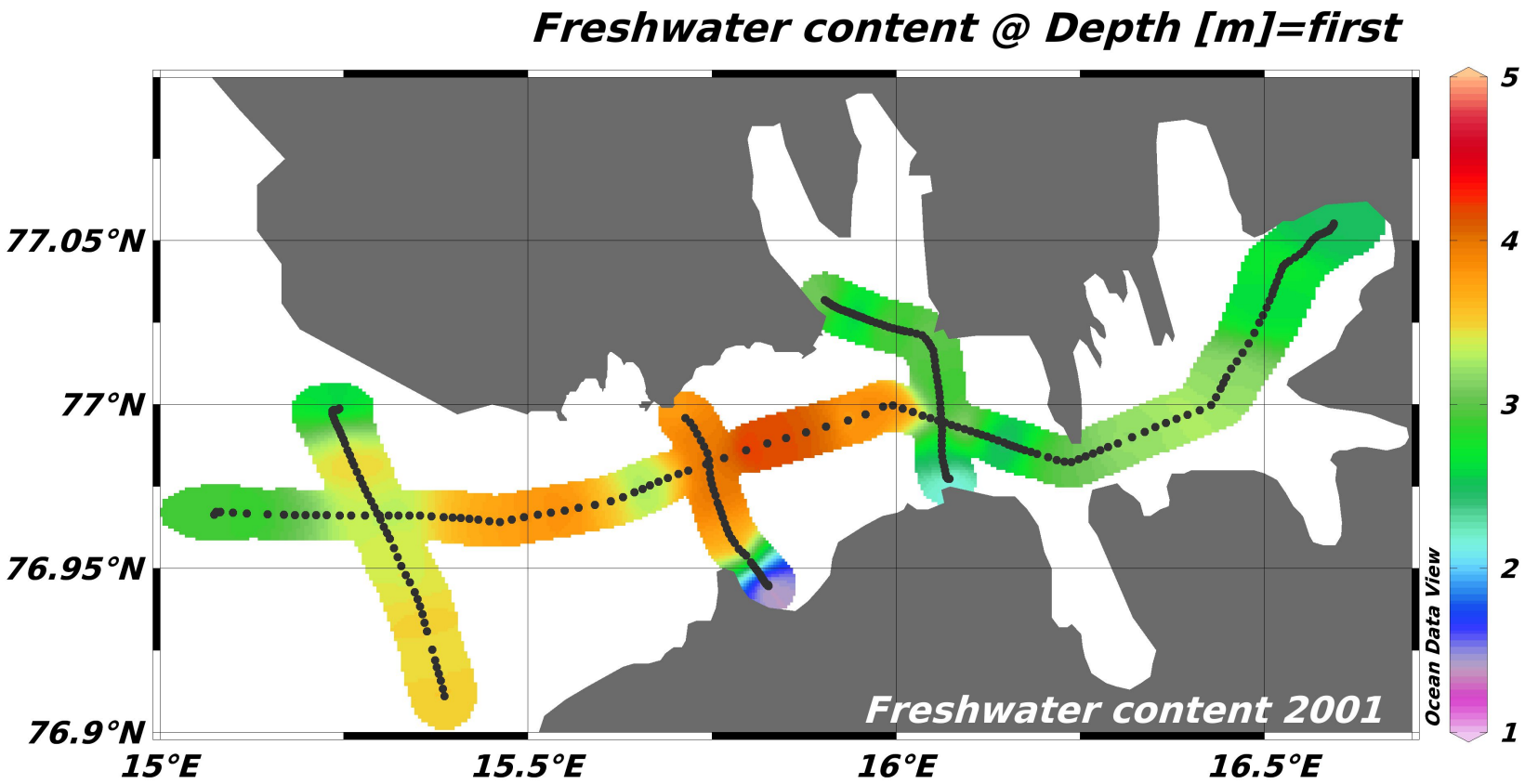
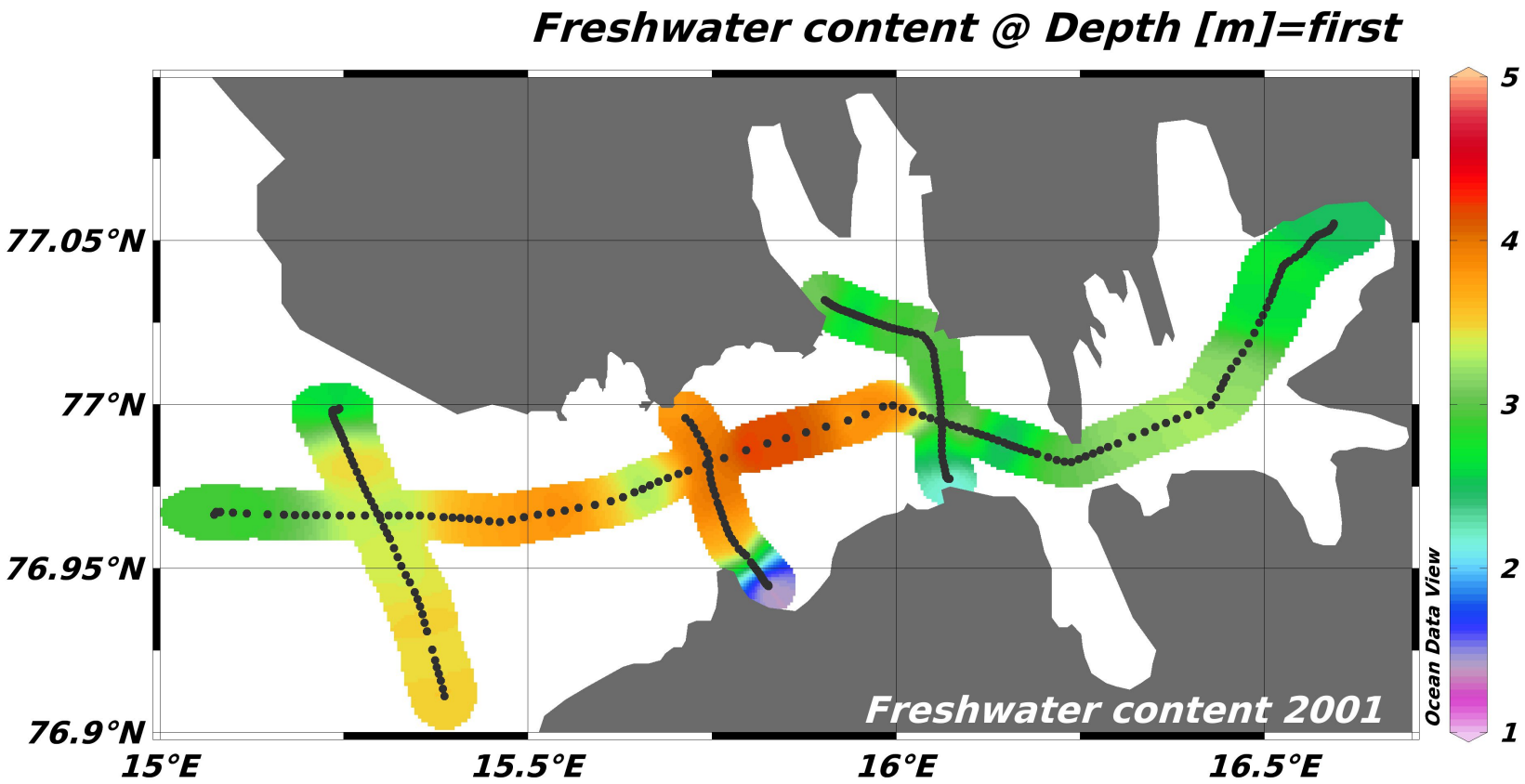


Figure: Height of freshwater column, July 2001. Fresher water at northern side of fjord. Less freshwater deeper into the fjord, (?!?)

Calculation of height of freshwater column based on depth integration of salinity profiles:

$$h_{fw} = \int_{z}^{0} \frac{S_{ref} - S}{S_{ref}} dz \tag{1}$$

$$S_{ref} = 34.8$$



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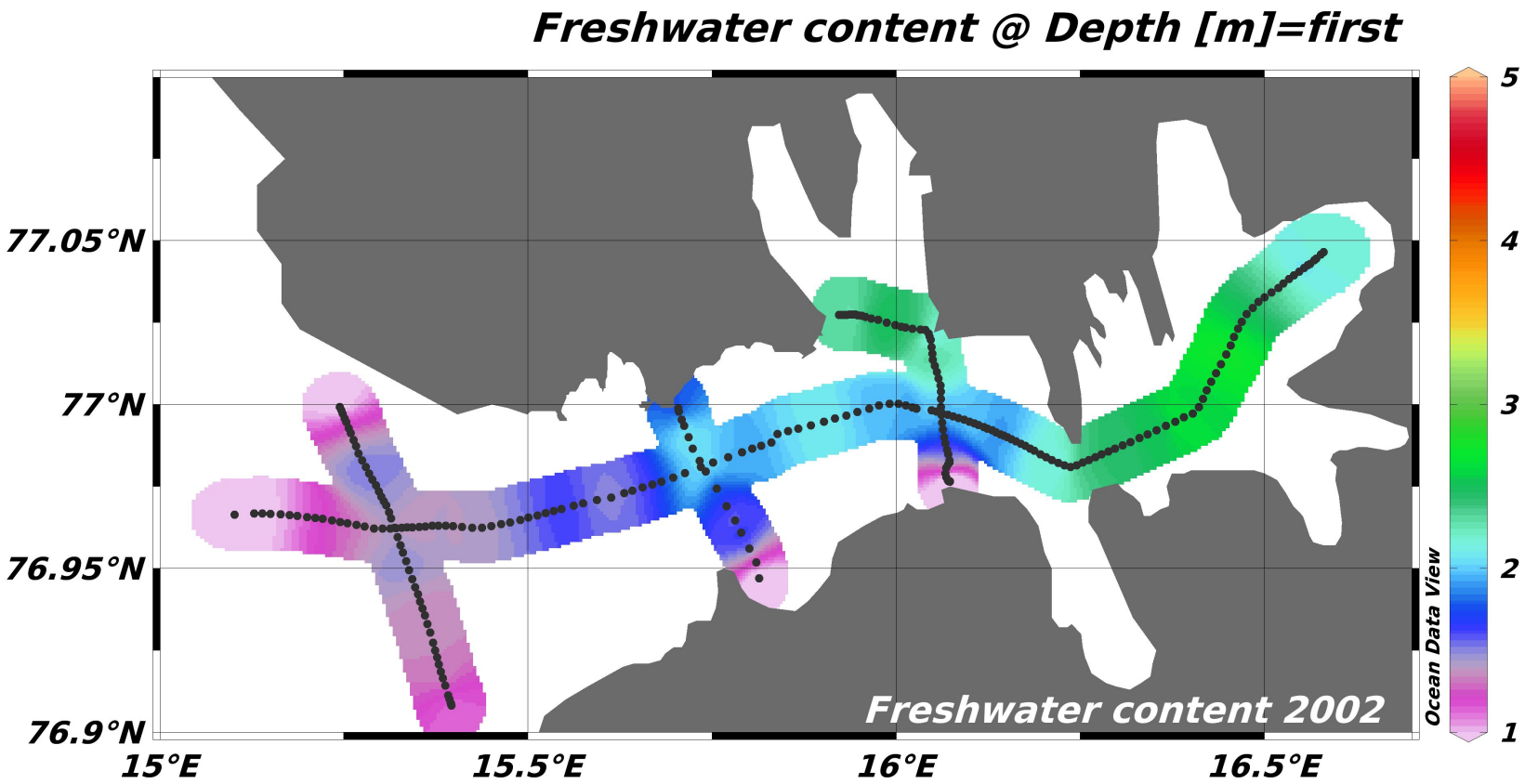

Figure: Height of freshwater column, July 2002. Fresher water at norther side of fjord. Small amount of freshwater outside of the fjord.

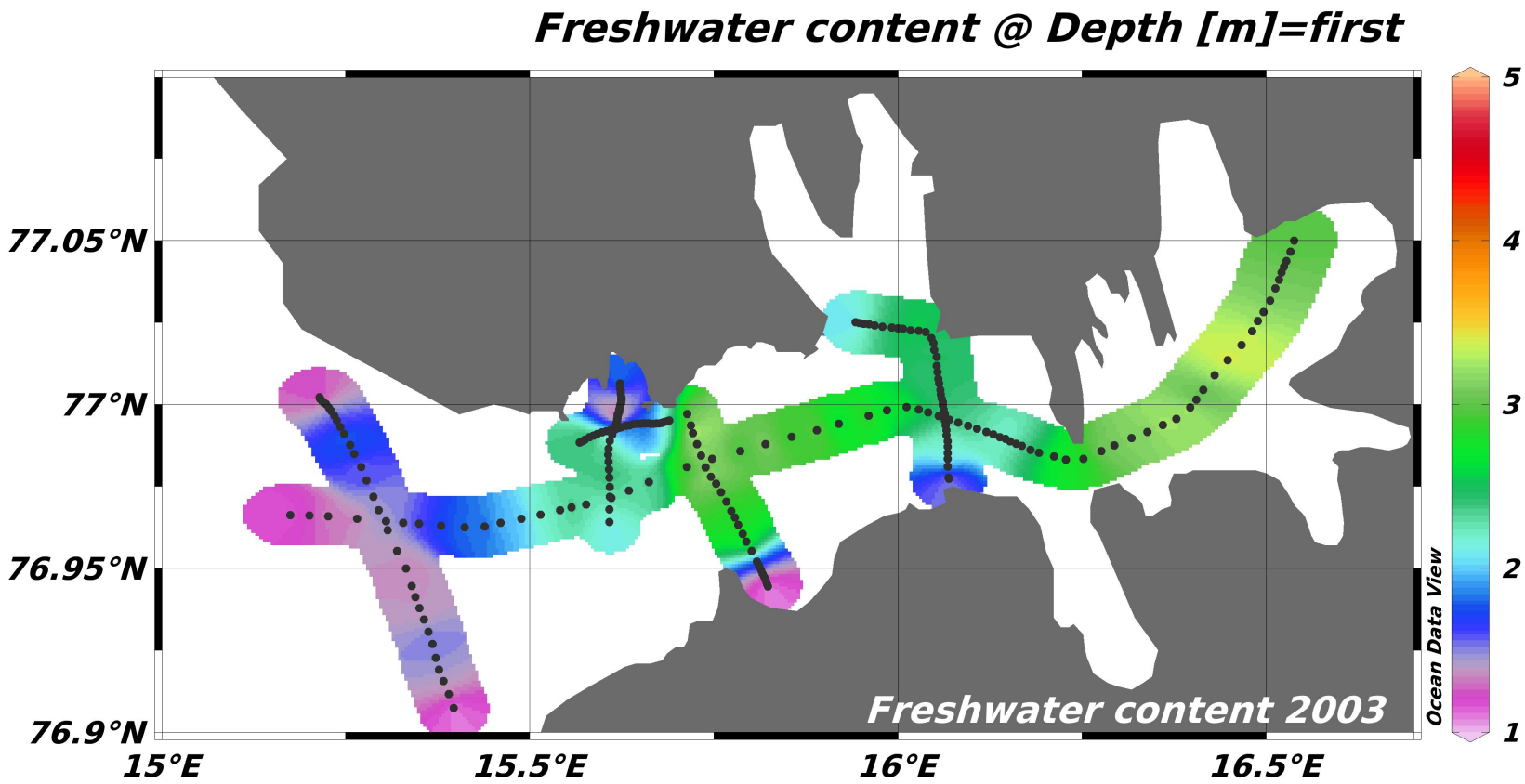

Figure: Height of freshwater column, July 2003. Same north-south variation. More freshwater in-fjord than out-fjord.

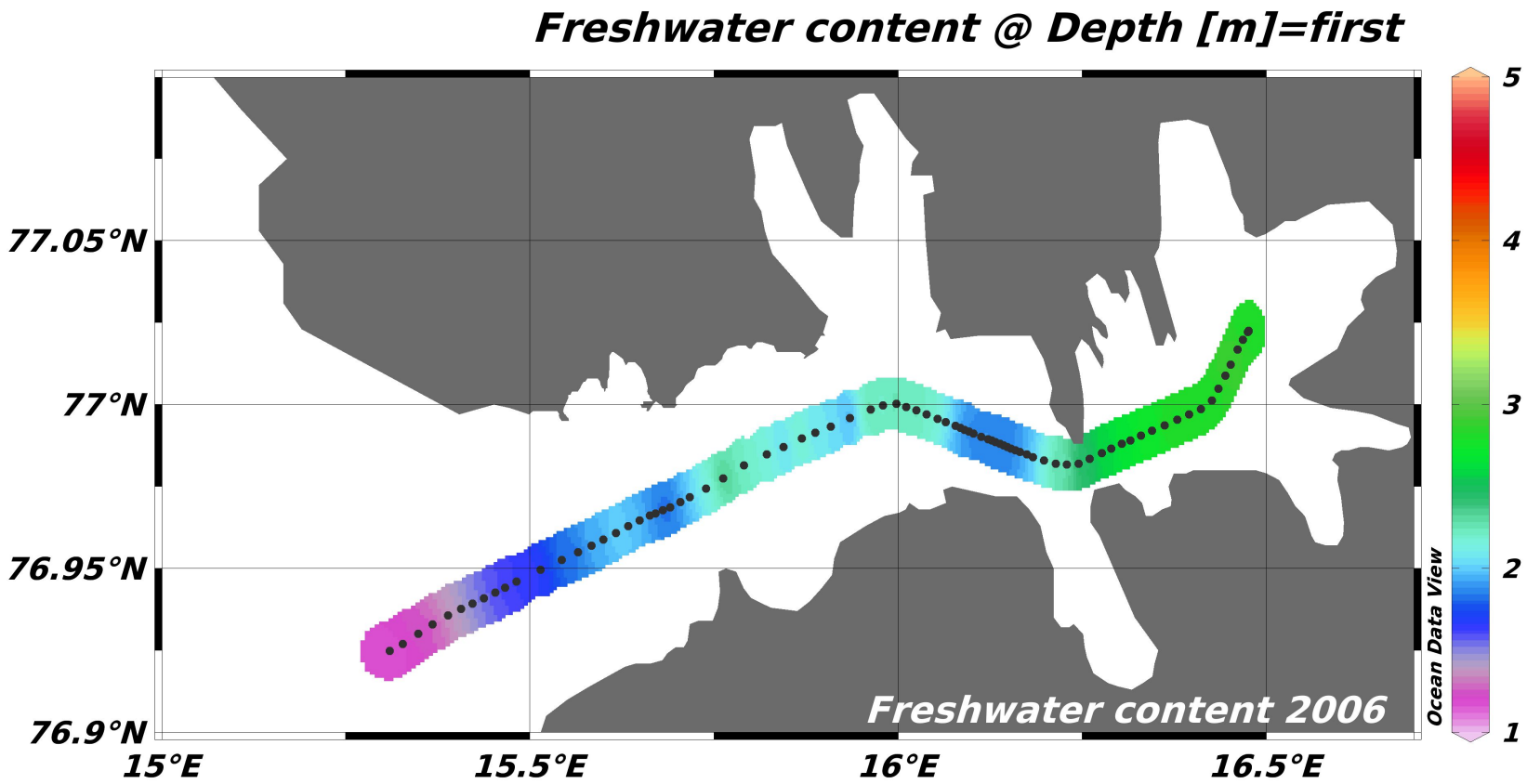

Figure: Height of freshwater column, July 2006. More freshwater in-fjord than out-fjord.

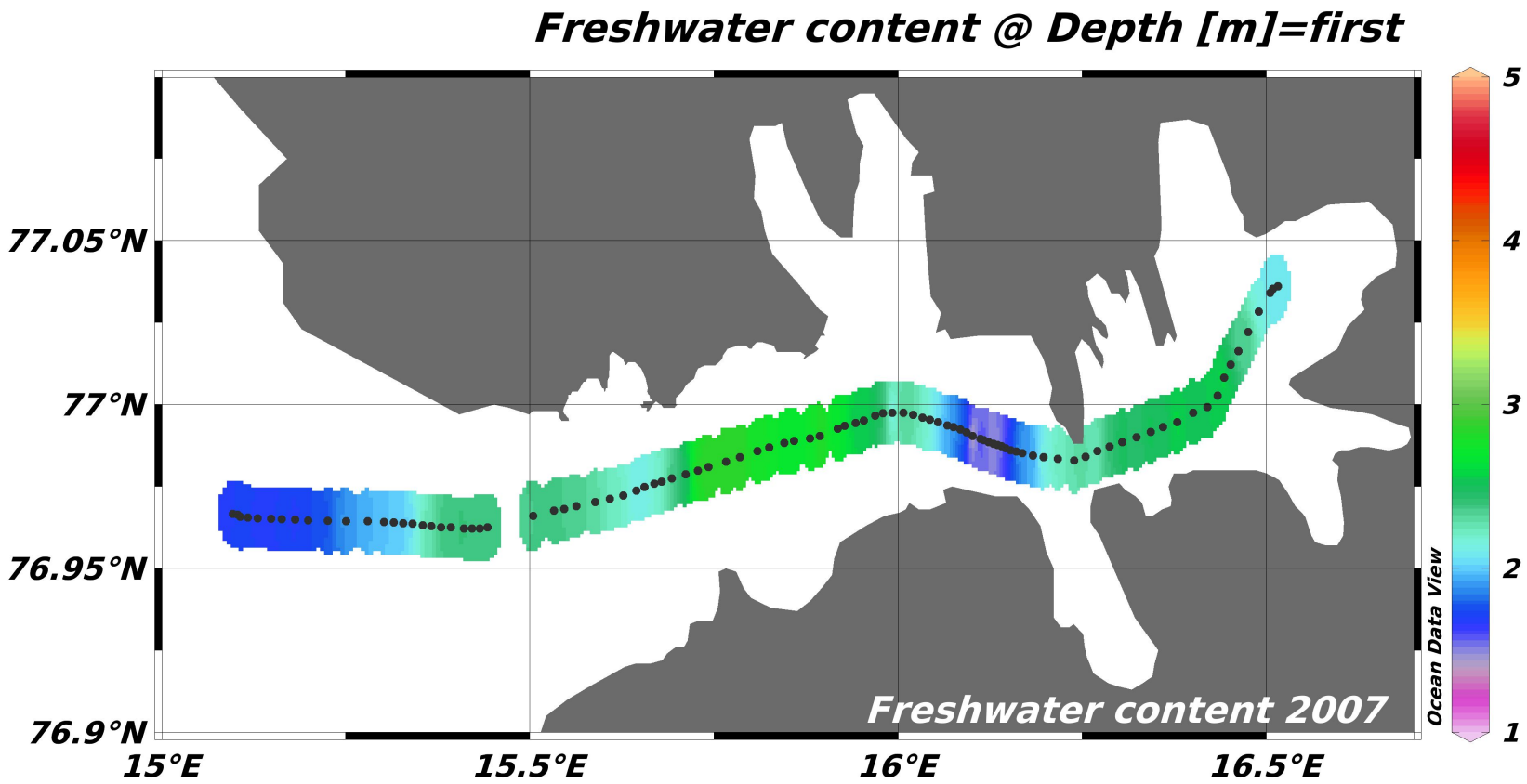

Figure: Height of freshwater column, July 2007. Most freshwater in the center of the fjord. High reference salinity?

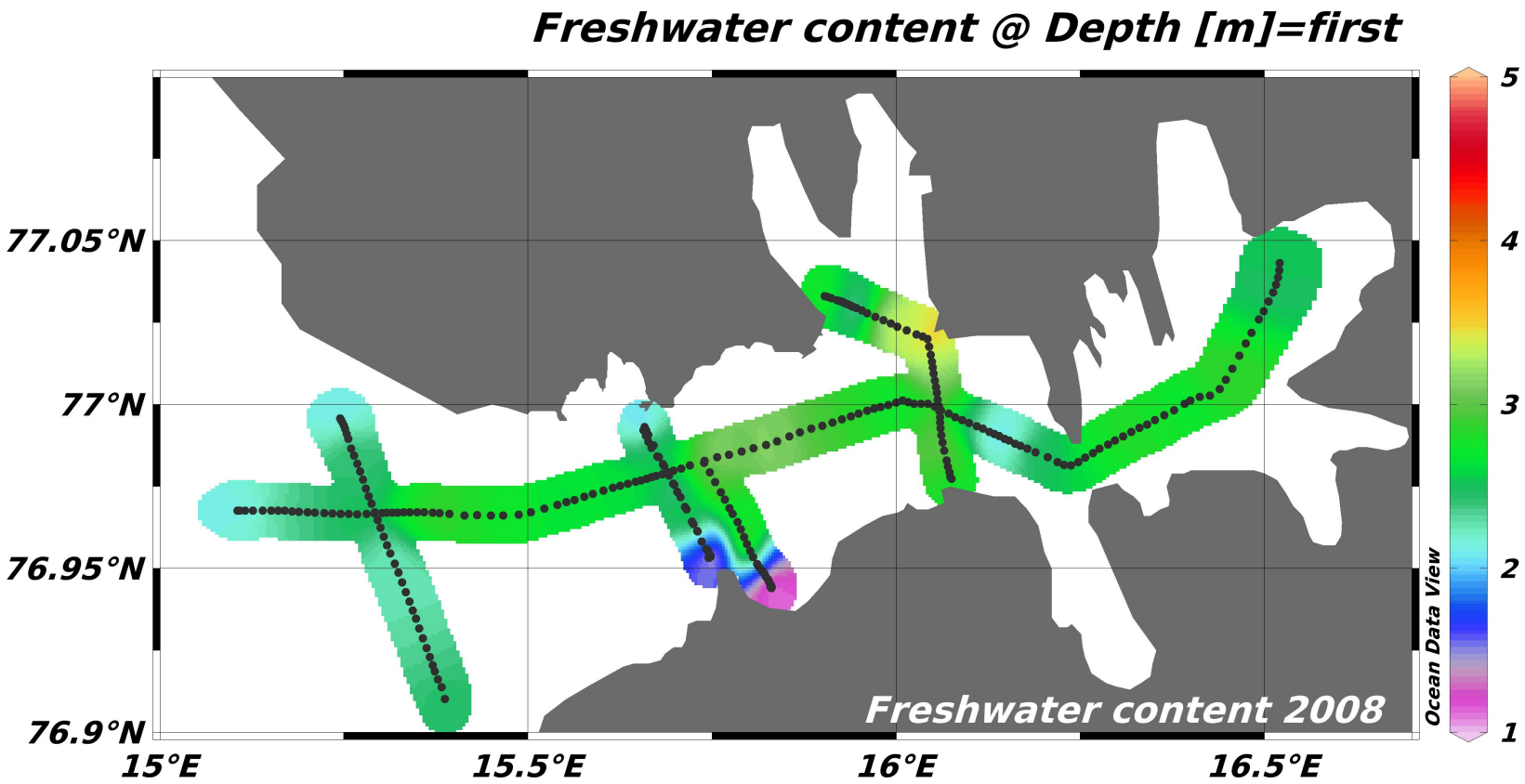

Figure: Height of freshwater column, July 2008. More freshwater on northern side of the fjord.

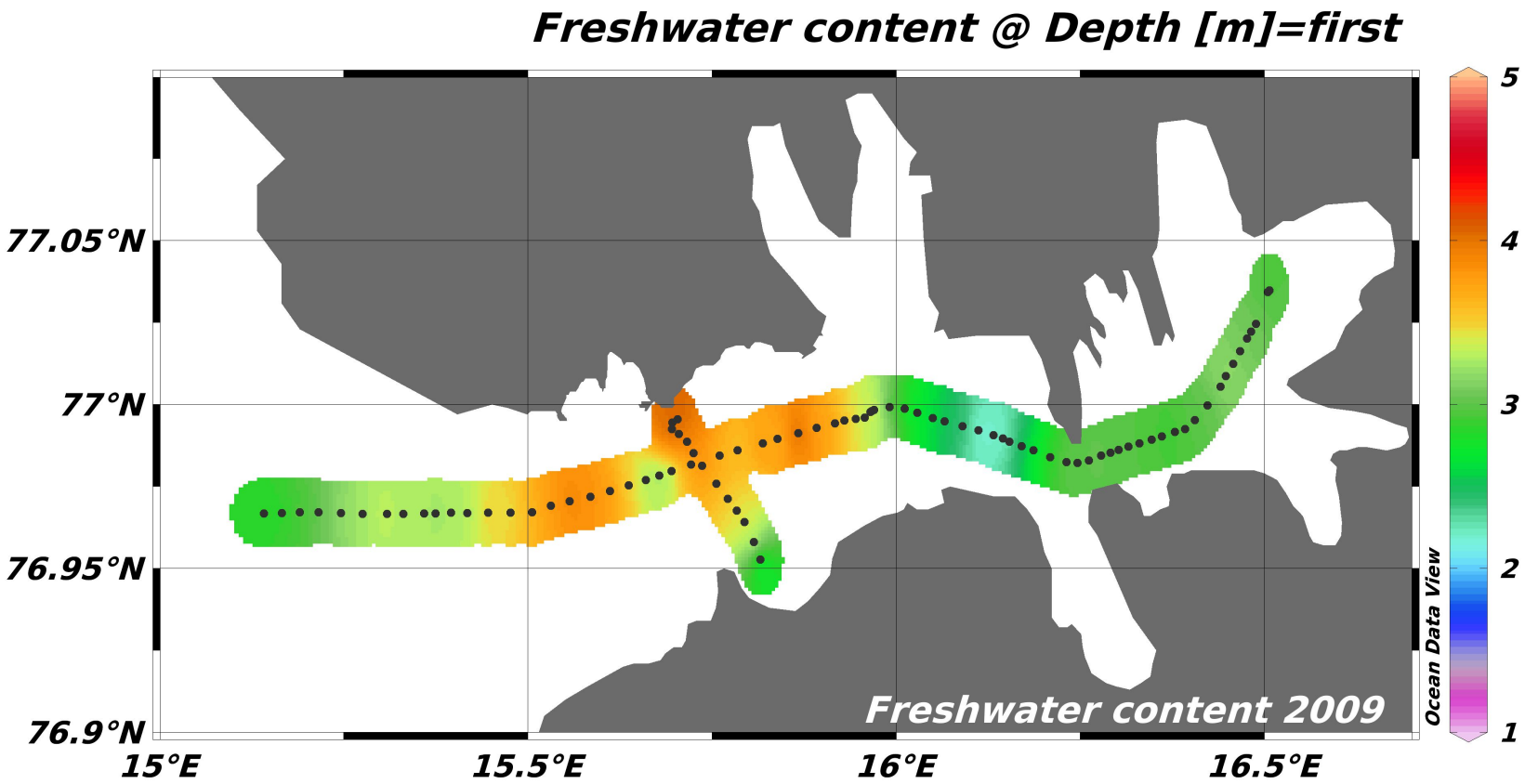

Figure: Height of freshwater column, July 2009.

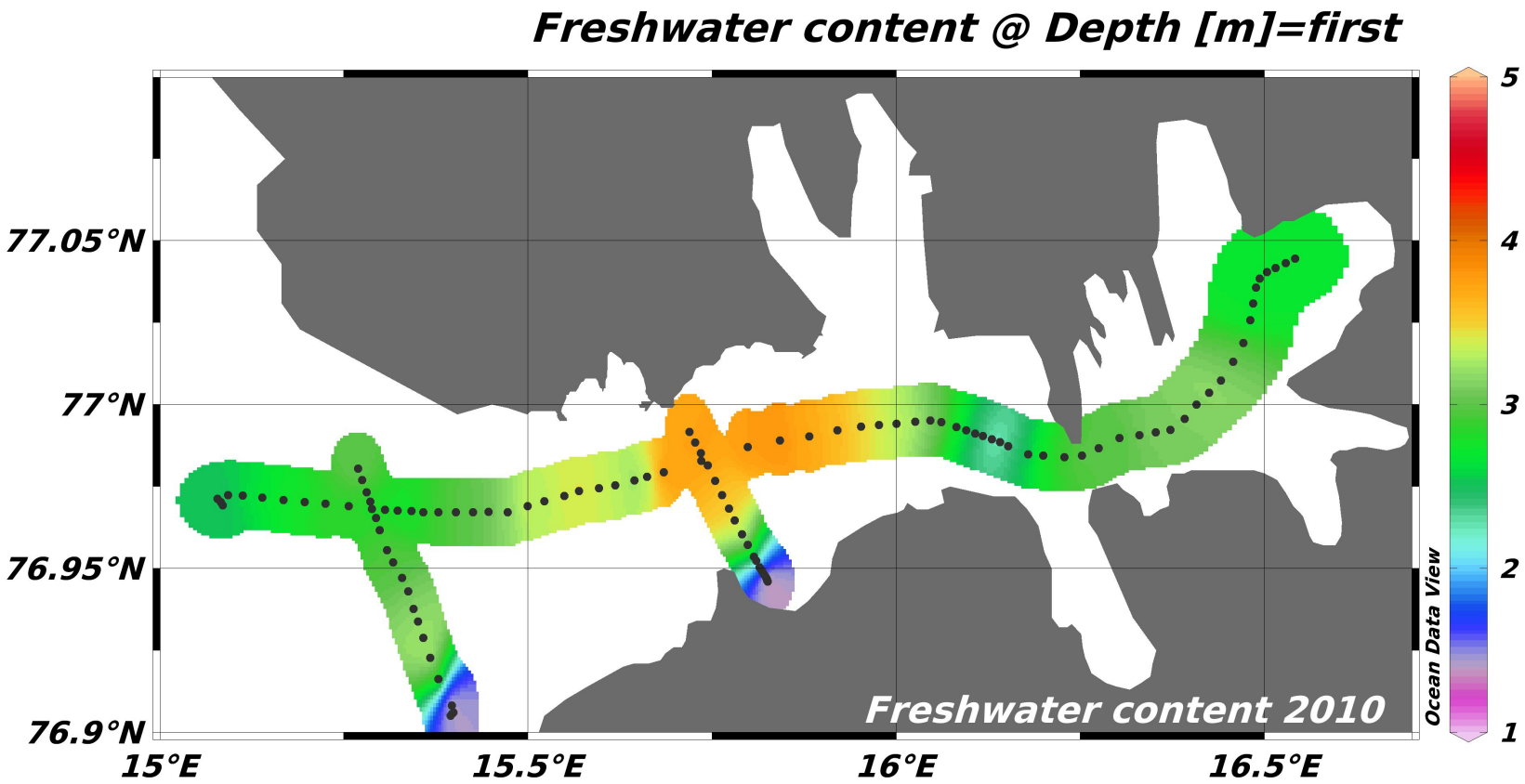

Figure: Height of freshwater column, July 2010. Depth variation?

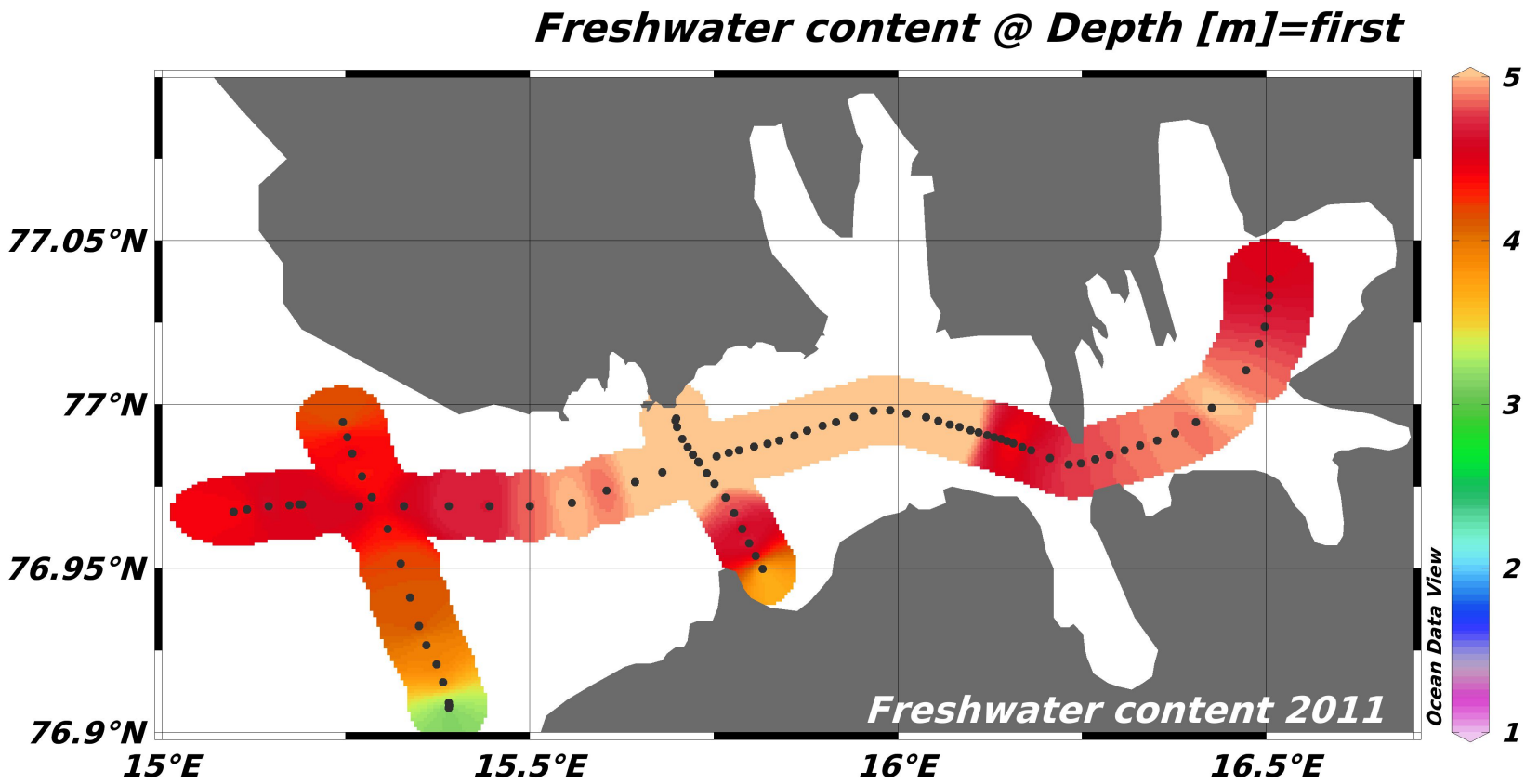

Figure: Height of freshwater column, July 2011. A LOT of freshwater in the fjord. Ice in the fjord? Eye witnesses in the audience?

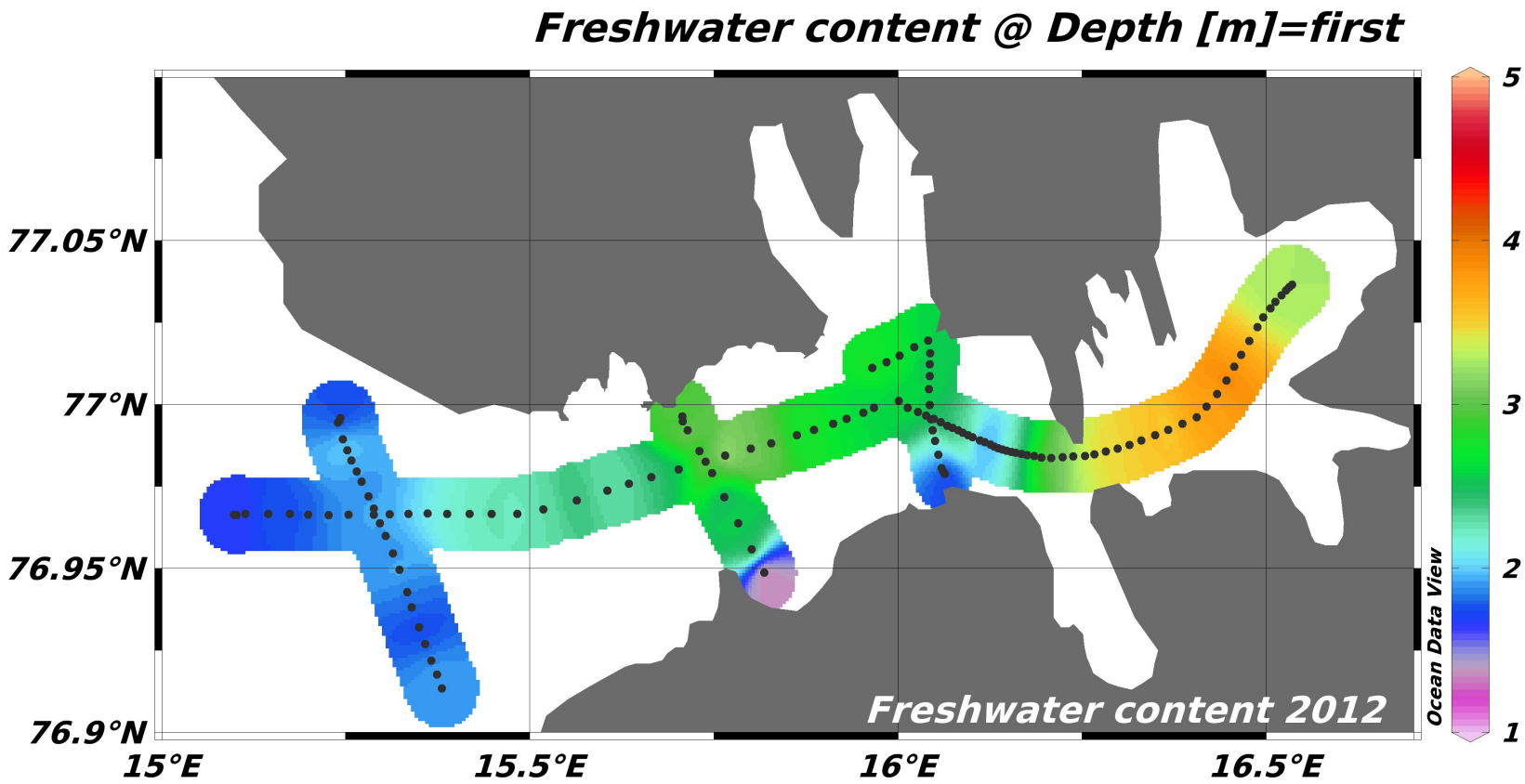

Figure: Height of freshwater column, July 2012. More freshwater in-fjord than out-fjord. Less depth variation due to more saline source water?

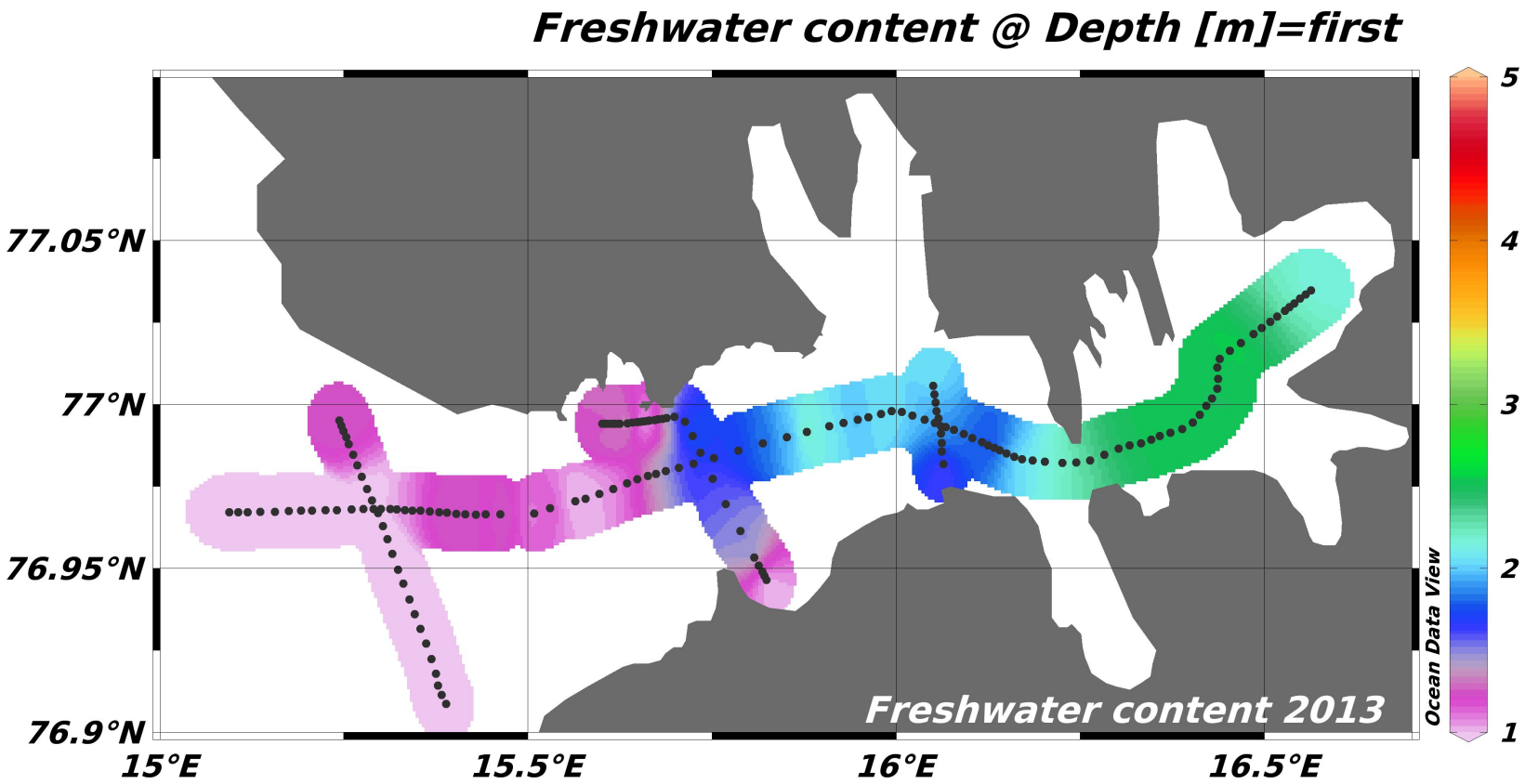

Figure: Height of freshwater column, July 2013. Low freshwater column in fjord. In-fjord/out-fjord variation.

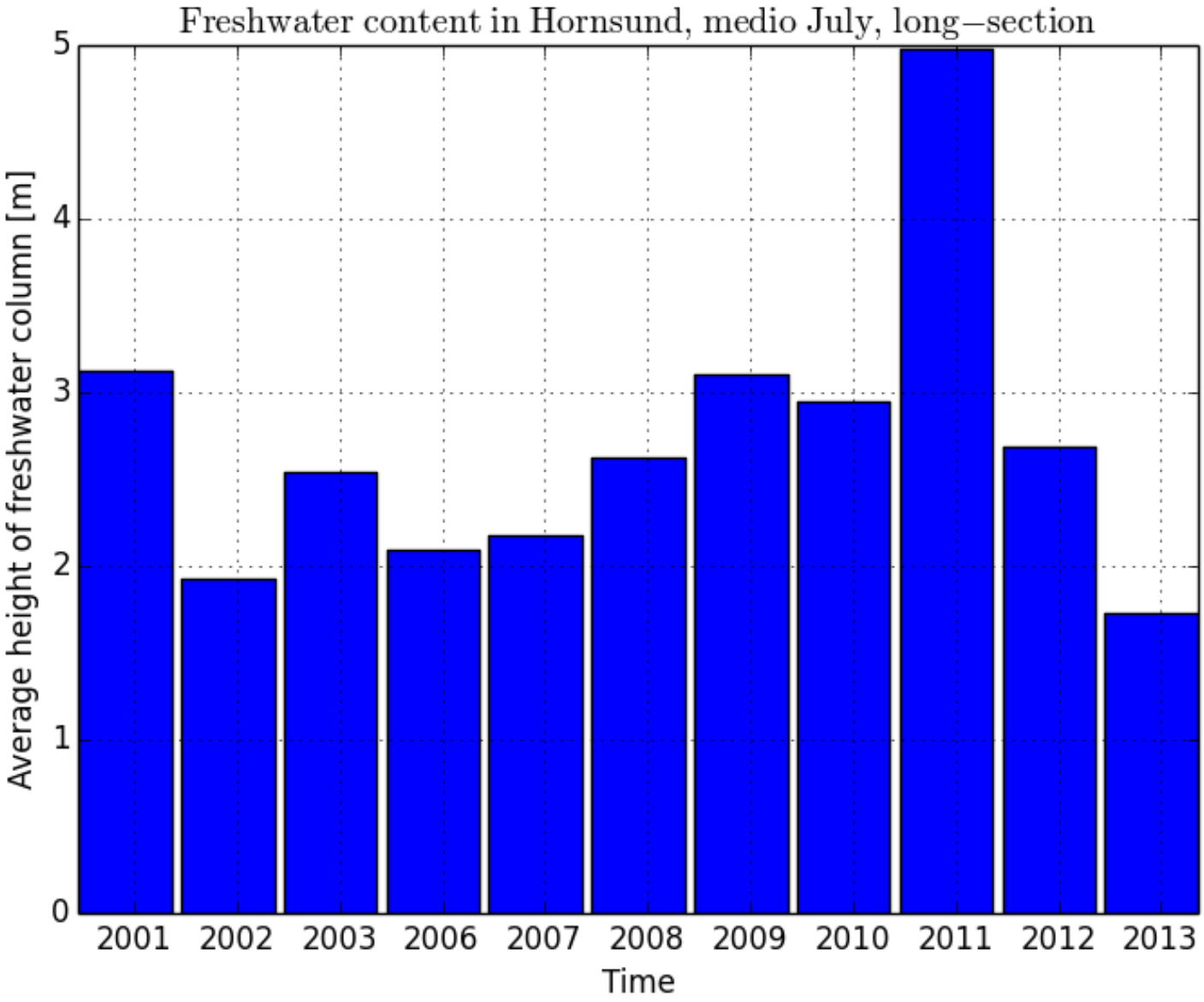

Figure: Freshwater content in Hornsund based on long-secion data.

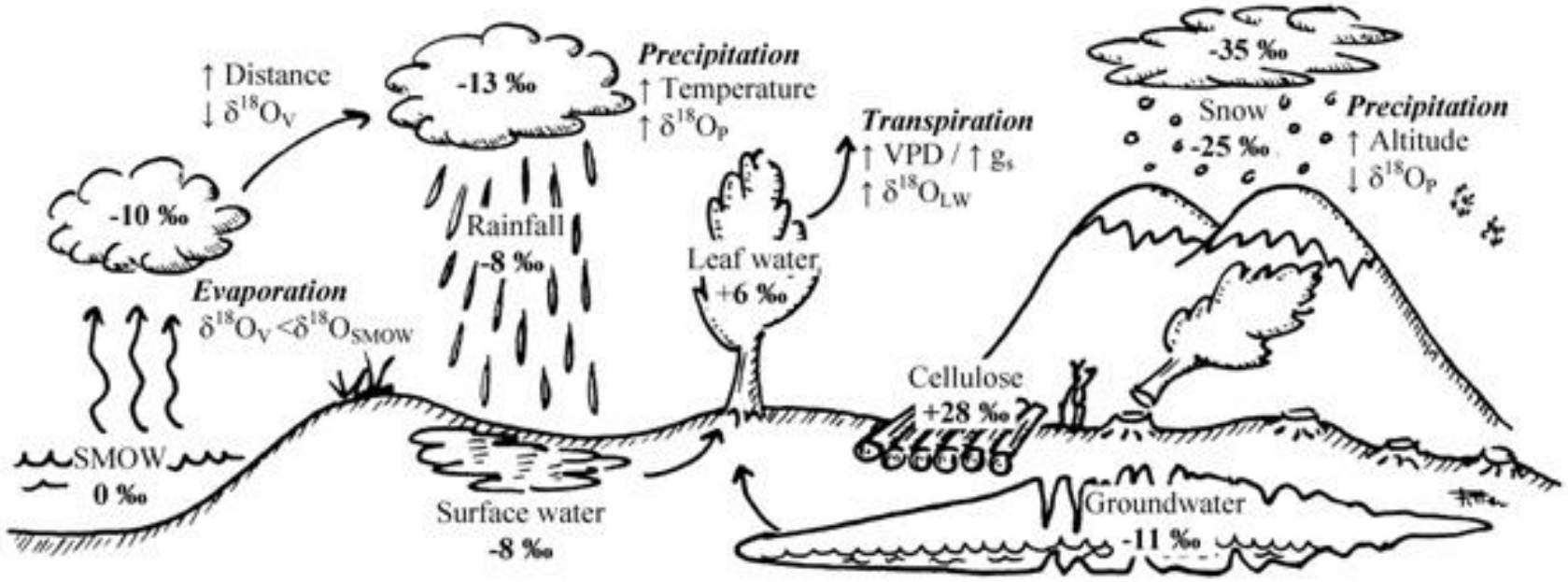

Figure: Fractionation of $\delta^{18}O$ during condensation/evaporation. Opposite effect during freezing.

Three sources of water: sea water (f_s), sea-ice melt water (f_i) and meteoric melt water (f_m). Determination of freshwater sources based on mass balance, salt balance and $\delta^{18}O$ balance:

$$f_s + f_i + f_m = 1 \tag{2}$$

$$f_s S_s + f_i S_i + f_m S_m = S_{measured} \tag{3}$$

$$f_s \delta^{18}O_s + f_i \delta^{18}O_i + f_m \delta^{18}O_m = \delta^{18}O_{measured} \tag{4}$$

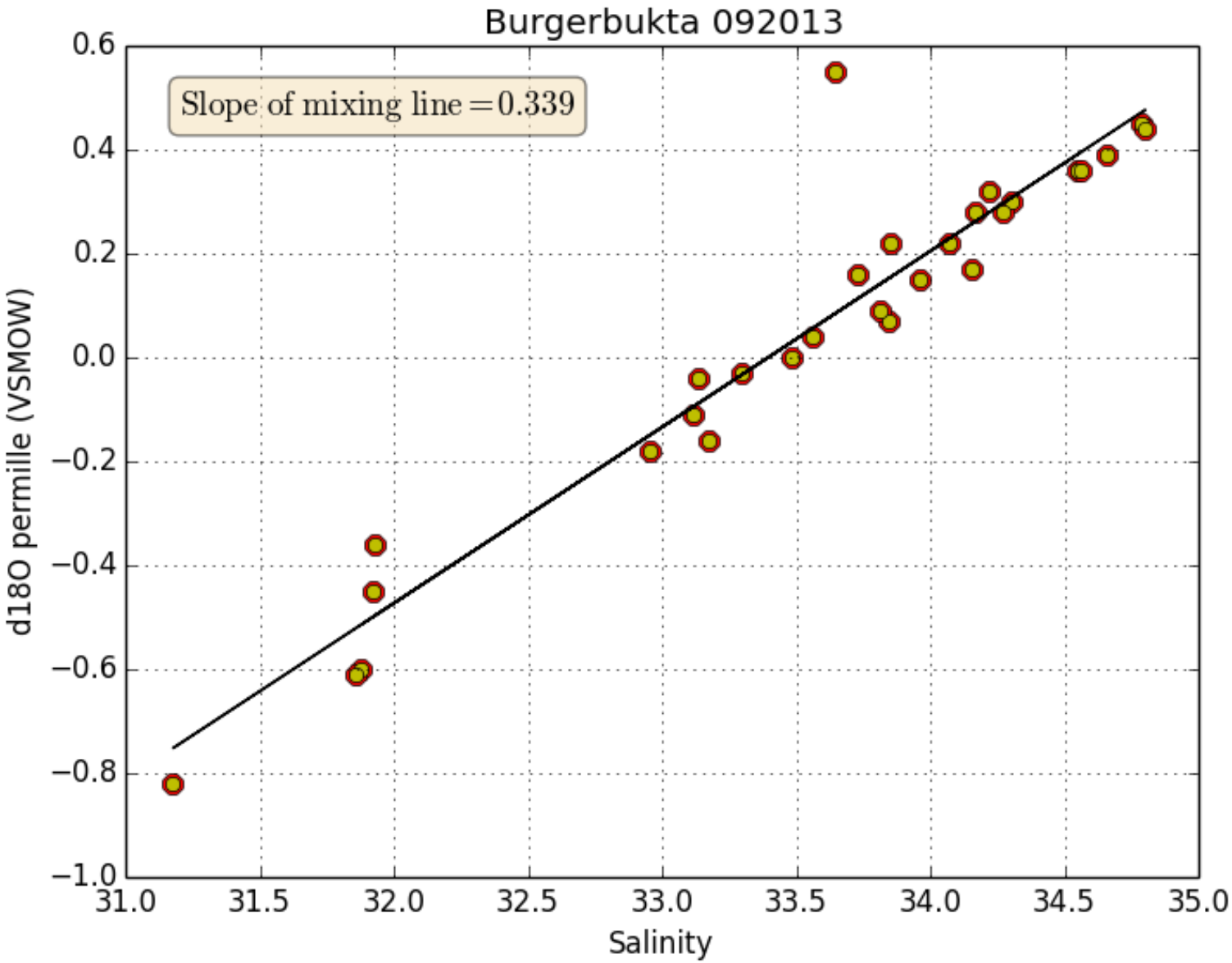

Figure: d18O-salinity mixing line

"I'm sorry. The ad said we need a whale tagger. Not a tail wagger."