Supporting Information for "Internal tides responsible for lithogenic inputs along the Iberian continental slope"

Simon Barbot[1], Marion Lagarde[1], Florent Lyard[1], Patrick Marsaleix[1], Pascal Lherminier[2], Catherine Jeandel[1]

[1]LEGOS, Université de Toulouse, CNES, CNRS, IRD, UPS, Toulouse, France

[2]LOPS, Université de Brest, CNRS, IRD, Ifremer, IUEM, Plouzan, France

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Introduction

Text S1 details the methodology for the calculation of the slope criticality. Figures S2 and S3 show validation of the barotropic and baroclinic tides for all the tidal harmonics used in the BOBIBE simulation. Figure S4 shows the validation of the IBIRYS12 reanalysis compared to GEOVIDE transect over co-located stations. Figure S5 details the impact of the average period used for the circulation to investigate the sediment transport.

Text S1. Calculation of the slope criticality

The calculation of the critical slope is based on the ratio between the topography slope γ and the IT wave beam slope l. If $\gamma/c > 1$, the slope is considered as steep. If $\gamma/c > 1$, the slope is considered as flat. If $\gamma/c = 1$, the slope is considered as critical. The expression of c can be found from the dispersion relationship of the internal gravity wave in a rotating fluid (Kundu et al., 2004):

$$\omega^2 - N^2 \frac{k_H^2}{k_H^2 + k_V^2} + f^2 \frac{k_V^2}{k_H^2 + k_V^2} = 0 \tag{1}$$

with ω the wave frequency, N the Brunt-Vissl frequency, f the Coriolis parameter, k_H the horizontal wavenumber and k_V the vertical wavenumber. N is defined by the potential density profile:

$$N^2 = -\frac{g}{\rho_0} \frac{d\rho_0}{dz} \tag{2}$$

with g the gravitational acceleration, ρ_0 the unperturbed potential density. So for a given density profile, the IT wave beam slope can be calculated as the ratio between horizontal and vertical wavenumber:

$$c^2 = \frac{k_H^2}{k_V^2} = \frac{\omega^2 - f^2}{N^2 - \omega^2} \tag{3}$$

The calculation is made for M2, the dominant semi-diurnal tidal waves in this region. The diurnal tidal waves have no relevant criticality slope in this area because located outside the critical latitude ($f \geq \omega$).

References

Kundu, P., Cohen, M. I., & Hu, H. H. (2004). *Fluid mechanics*. Amsterdam: Elsevier Academic Press.

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Zunino, P., Lherminier, P., Mercier, H., Daniault, N., García-Ibáñez, M. I., & Pérez, F. F. (2017). The GEOVIDE cruise in may–june 2014 reveals an intense meridional overturning circulation over a cold and fresh subpolar north atlantic. *Biogeosciences*, *14*(23), 5323–5342. doi: 10.5194/bg-14-5323-2017

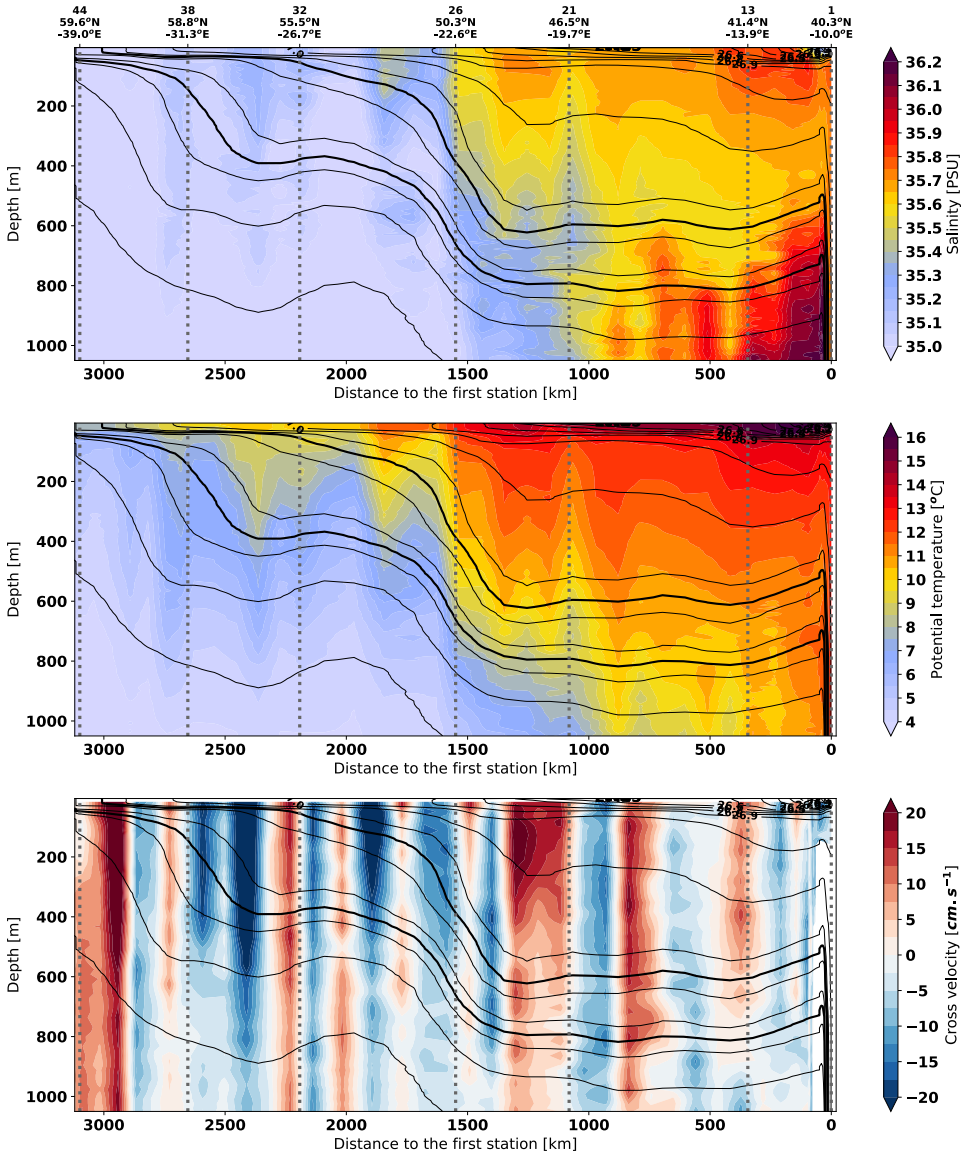

Figure S1. GEOVIDE measurements of (upper panel) the salinity, (central panel) the potential temperature and (lower panel) the velocity across the section from LADCP. The black lines represent the isopycnals of potential density anomaly. Each station where particles were sampled are represented by the dotted gray lines (station number and localization on top). Data from Zunino et al. (2017).

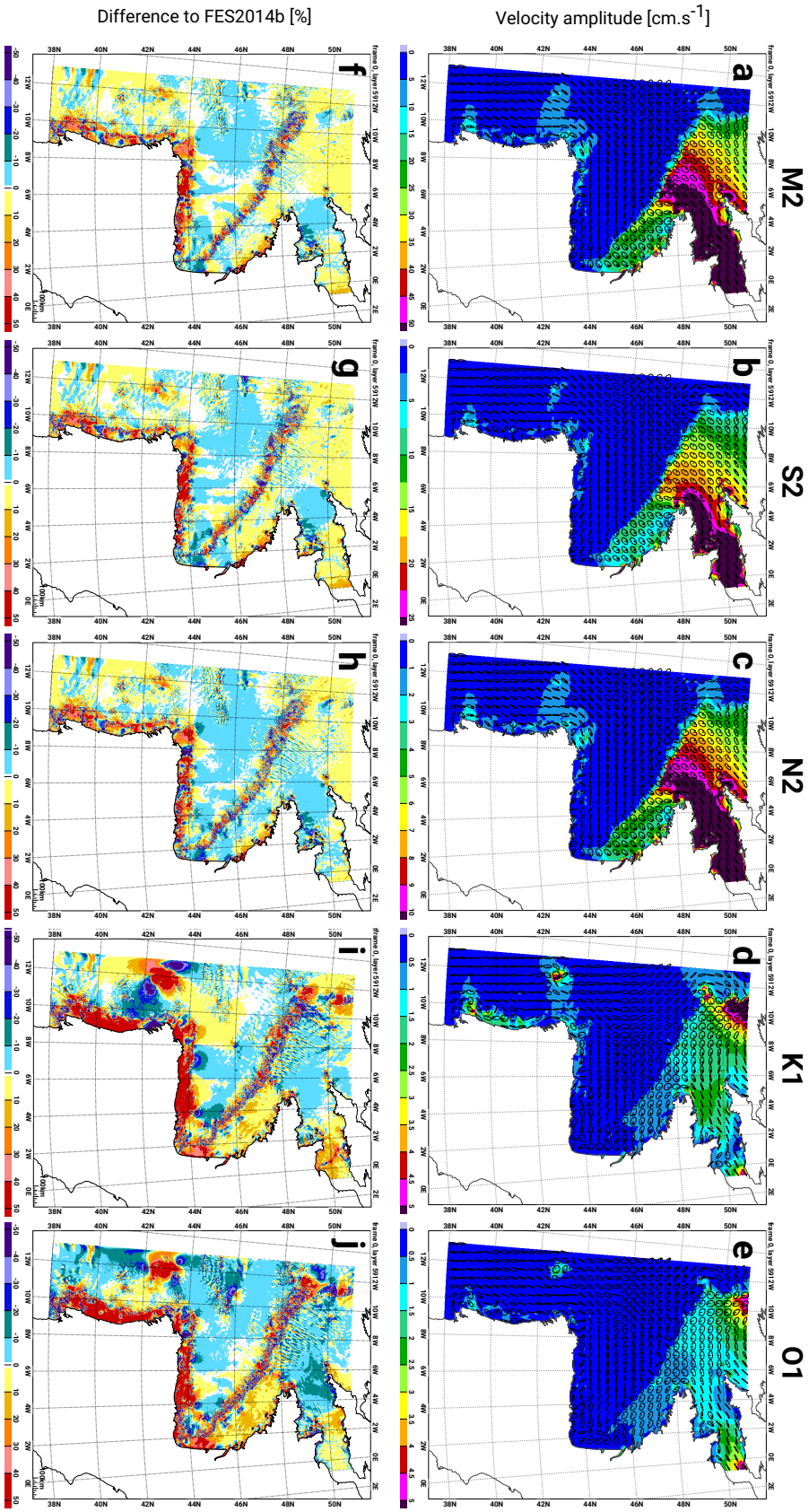

Figure S2. (a-e) Barotropic velocity amplitude for the simulated tidal harmonics and (f-j) the difference to FES2014b atlas (Lyard et al., 2021).

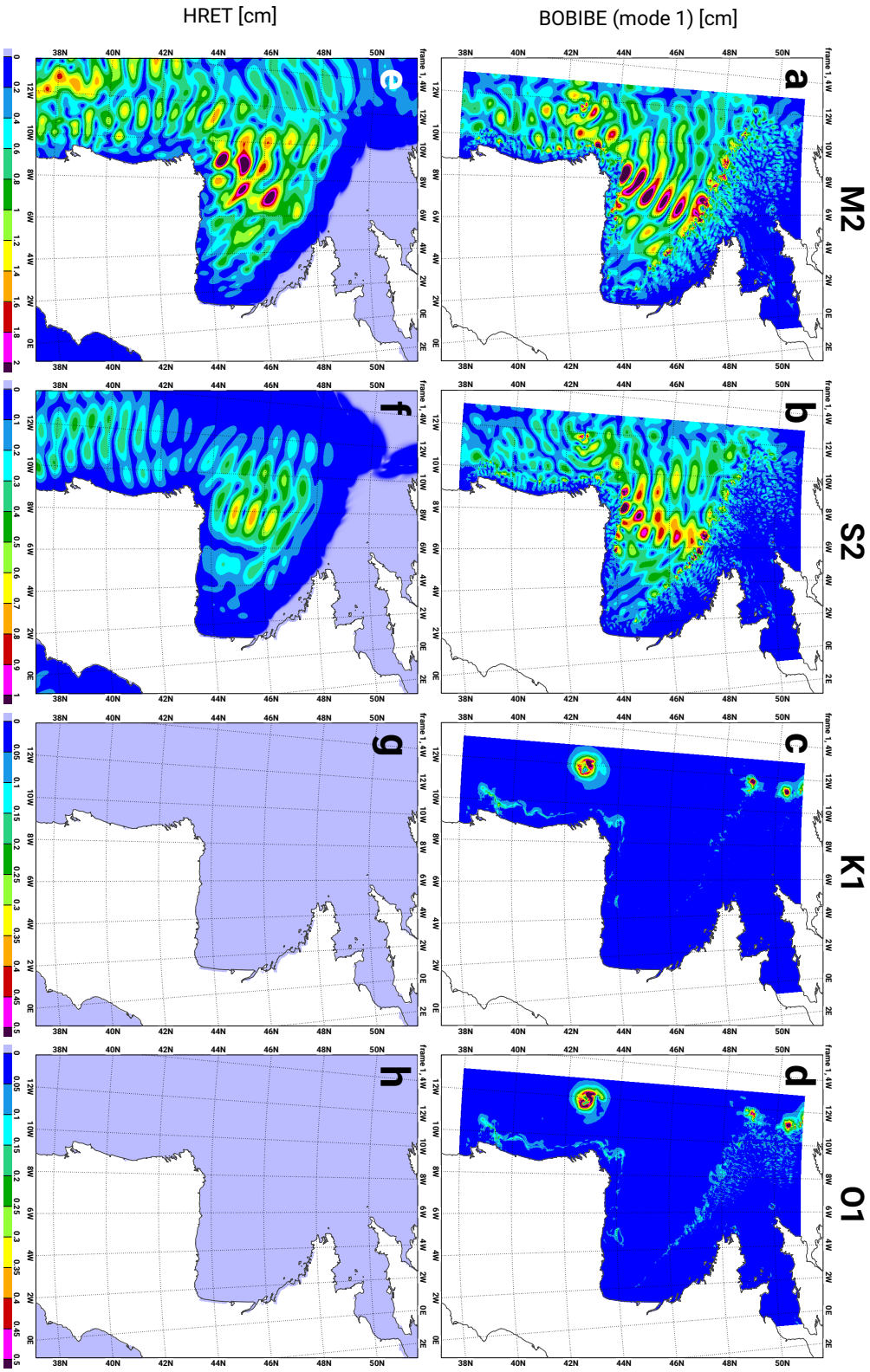

Figure S3. (a-d) Internal tide surface elevation amplitude for M2, S2, K1, O1 simulated tidal harmonics and (e-h) the corresponding value from HRET empirical IT atlas (Zaron, 2019).

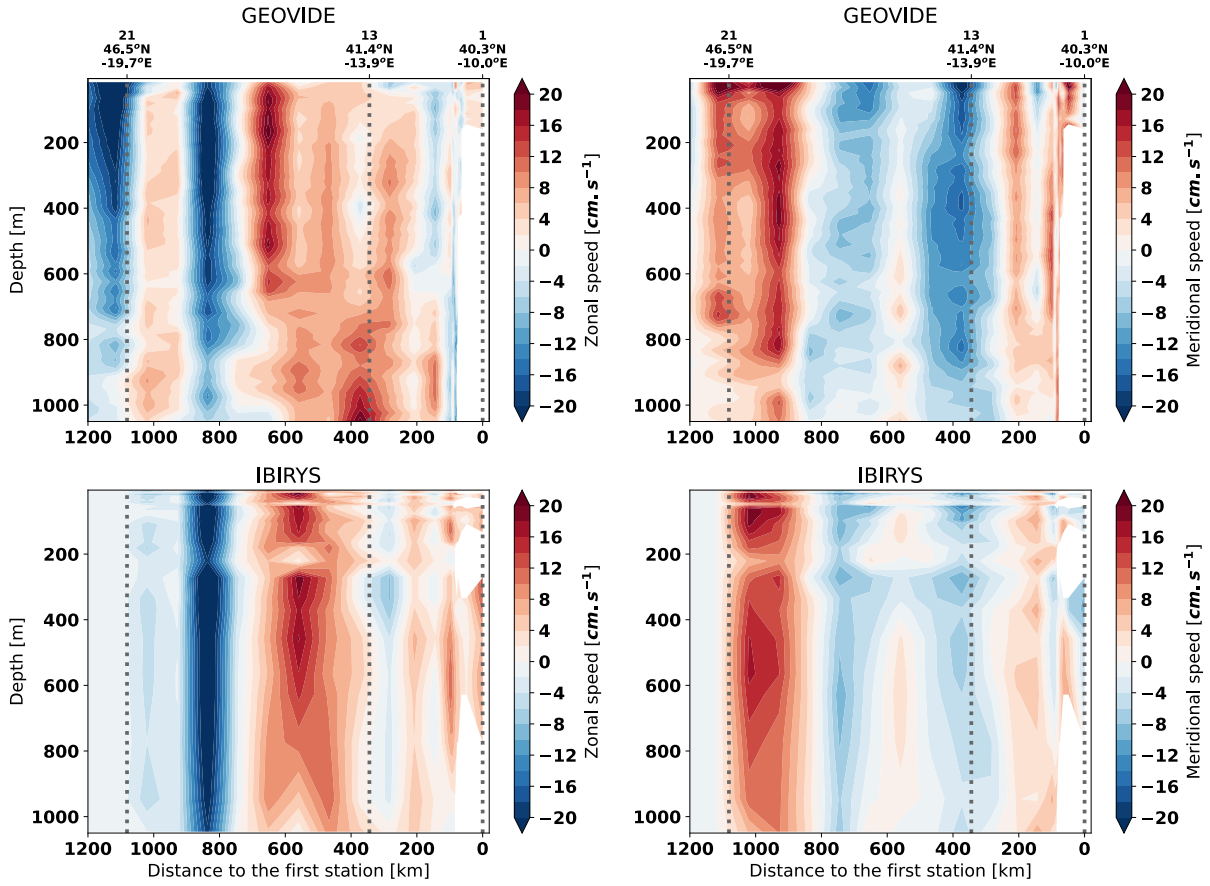

Figure S4. Vertical structure of the currents in the daily mean of IBIRYS12 reanalysis and GEOVIDE measurements. The values of IBIRYS12 are co-located (time and space) with the stations of the GEOVIDE cruise. GEOVIDE measurements from Zunino et al. (2017).

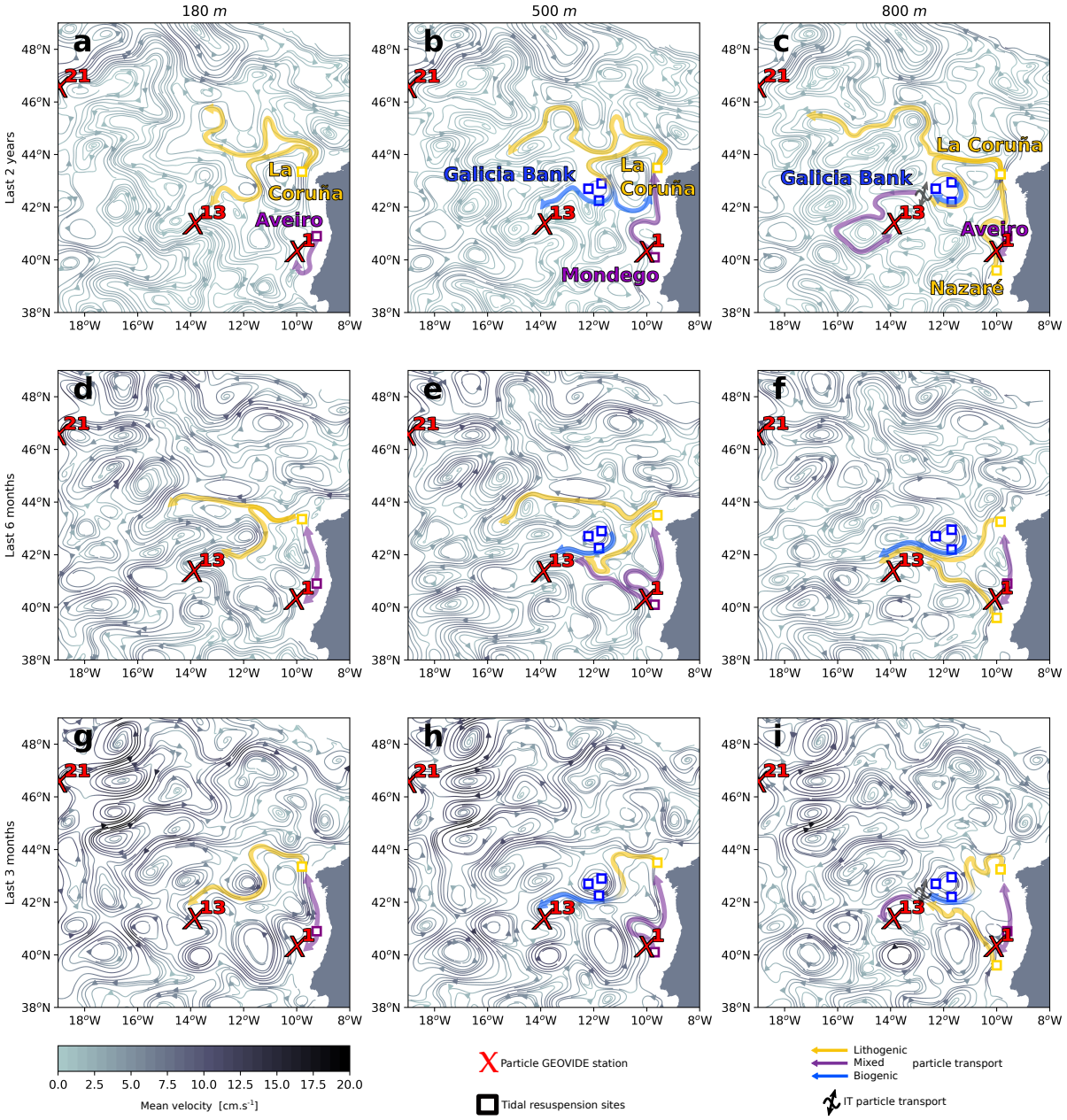

Figure S5. Streamline based on the mean velocity (top) 2 years, (center) 6 months and (bottom) 3 months before June 2014 at (left) 180 m, (middle) 500 m and 800 m. The red crosses show the GEOVIDE particle measurement stations. The squares show the location of tidal resuspension sites. The arrows describe the potential pathways of the particles from the tidal resuspension sites to the GEOVIDE stations. The colors define the nature of the particles transported: yellow for lithogenic, blue for biogenic and purple for both lithogenic and biogenic mixed.