Table 2
Parameters of the tracer objective analyses

Horizontal grid resolution	9 km
18 flat levels	0.5, 15, 30, 45, 60, 90, 120, 170, 220, 270, 320, 750, 1400, 1600, 1800, 2000, 2250, 4000 m
Subbasin-scale zero-crossings	400 km
Subbasin-scale decorrelation scale	150 km
Mesoscale zero-crossings	50 km
Mesoscale decorrelation scale	30 km
Mesoscale time decorrelation	3 days
Subbasin-scale (historical) data error variance	0.2 (non-dimensionalized within 0 to 1)
Mesoscale (synoptic) data error variance	0.1 (non-dimensionalized within 0 to 1)

effect of baroclinicity and relief, which, by conservation of mass, induces vertical velocity adjustments at depths. As pointed out by Cane et al. (1998) and anticipated by Mertz and Wright (1992), it should not be understood in the sense of the classic ‘‘JEBAR term’’, which does not account for all topographic effects; (ii) the diffusion of momentum (surface and bottom diffusions, coastal stresses, eddy viscosities), in accord with the specifics of the fixed density field. This process includes the fast adjustment (days) to a momentum bottom boundary layer model (MacCready and Rhines, 1993), which here dominates the slow (years) pressure compensation of Mellor and Wang (1996) since the first-guess geostrophic velocities are already small at depths; and finally, (iii) the adjustment of the momentum nonlinearities. The adjustment PE integration is not a search for a steady state. It is only analogous to a ‘‘Picard integration’’ (Garabedian, 1964) in the sense that it reduces the time-rates-of-change towards values acceptable for a smooth, but high Reynolds number, PE dynamical regime.

The initial PE adjusted velocities and corresponding objectively analyzed tracers, are shown on Fig. 5. One recognizes the features described in Section 1.1. The AIS is clearly visible on the total velocity map, with several meanders and mesoscale eddies along its path, e.g. two cold eddies starting to pinch off the IBV. The PE adjusted barotropic transport through the Strait on Sept. 15 is estimated to about 0.7 Sv. The dominant uncertainties of these fields, in part due to data errors and environmental noise, are estimated in Section 3.1.

2.4. Assimilation scheme

In this study, the Bayesian approach is approximated by minimum error variance principles. To carry out the data-driven forecasts in real-time, filtering problems are solved: data are melded with the forecast as they become available, without correcting past estimates based on future observations. The AXBT data with estimated salinity (Sections 2.1 and 2.3) are assimilated once, on the day they are observed. The present ESSE scheme and its parameters are presented in Section 2.4.1. To evaluate or benchmark the ESSE fields, an OI scheme is utilized. It is described in Section 2.4.2. For recent comprehensive data assimilation treatises, we refer to Daley (1991), Ghil and Malanotte-Rizzoli (1991), Bennett (1992), Sundqvist (1993), Evensen (1994), Cohn and Todling (1996), Malanotte-Rizzoli (1996), Wunsch (1997) and Robinson et al. (1998a).