extent. This group of eigenvectors is associated with the Ionian shelfbreak/slope processes and is weakly coupled to the rest of the domain.

Fig. 10 shows the group of vectors 31 to 34. They are the first vectors which have a strong distinct signature associated with the ABV and MCC, around the basin between Pantelleria and Malta. The horizontal maps for $\psi$, $T$, $S$ and $\hat{u}$ are shown. Singular vectors (30) and (31) are close to quadrature of phase in the horizontal. The vector (33) is close to the 90° horizontal rotation of vectors (30) and (31), with lobes related to the bottom topography (Fig. 2). The wavelength is again of order 100–140 km. For all four vectors, $T$ and $S$ are of opposite spatial phase in the surface, with $\psi$ in phase with $T$. In difference with Fig. 9, the amplitudes of the normalized barotropic transport anomalies and corresponding external velocities (definition in Section 2.2) are about half of those of the normalized surface internal velocities and tracers, which are similar. From this group of four vectors, the result is that the dominant variability of the ABV and MCC during the period considered is mainly internal and baroclinic.

Fig. 11 is a selection of vectors which dominant signature represents patterns coupling the Ionian slope region with the basin between Pantelleria and Malta. Surface maps for $T$, $S$, $\hat{u}$ and $\psi$ are again shown. The $T$ maxima are at MAW depths (0–150 m) while the $S$ maxima are at lower MLIW depths (100–400 m in this region). For all four vectors, the normalized fields of $T$, $S$, $\hat{u}$ and $\hat{v}$ (not shown) have similar amplitudes. The dominant amplitudes of the $\psi$ anomalies and corresponding external flow are at least twice as small, excepted for the vector (44). Hence, for the vectors (36, 40, 45), as for these of Fig. 10, the velocity signatures are mainly internal. Each vector of Fig. 11 is now described successively. The $T$, $S$ anomalies of vector (36) have opposite signs, adding effects on the density anomaly and thus leading to important internal velocity variability. The vector (36) accounts for internal mesoscale patterns along the Ionian slope coupled with the dominant ABV and MCC baroclinic variability patterns. The features of vector (40) are closer to the coast of Sicily, with a distinct three-lobe structure around the MCC location and again, $T$, $S$ in opposition. The vector (40) is a mesoscale pattern coupling the ABV with the MCC and the western side of the IBV. Over the Ionian slope, the vector (44) shows a surface subbasin-scale tracer structure (350 to 450 km wavelength), with a strong external anomaly. The non-dimensional surface internal velocity anomaly is there twice as small as the external one (Section 2.2). The surface $T$, $S$ anomalies are in phase but the $T$ amplitude in the surface layer is three times larger than of $S$ ($S$ dominates at MLIW depths). Over the basin between Pantelleria and Malta, the tracer fields have opposite signs and the internal velocity anomaly, close to thermal-wind balance, dominates the external component. The vector (44) thus accounts for a coupling between mesoscale internal ABV/MCC processes and subbasin-scale external wave patterns along the Ionian slope. The vector (45) has again a subbasin-scale $T$, $S$ structure over the Ionian slope (350 to 450 km wavelength). As for vector (44), in this region, the $T$, $S$ surface patterns have the same sign, with the surface amplitude of $T$ three times larger than that of $S$. The external pattern amplitude is there about twice that of the internal one. However, in contrast with vector (44), the signature over the Pantelleria and Malta basin dominates. Its tracer component is of large-scales, with multiple centers and the $T$, $S$ maps in opposition. The internal velocity anomaly amplitude is there only almost twice that of the external (Section 2.2). The vector (45)