The paper entitle “Importance of the variability of hydrographic preconditioning for deep convection in the Gulf of Lion, NW Mediterranean” by L. Grignon, D. A. Smeed, H. L. Bryden, and K. Schroeder, tackle an important and hot scientific issue regarding the preconditioning of DW formation in the Western Mediterranean Sea (WM).

The ventilation depth of the water column in two region of deep water formation in the WM vary its intrinsic property as a result of a number of factors and can be considered an important fingerprint of the climate change and trends. Historically, this Mediterranean sub-basin region is one of the most analyzed, because is a place in which the warming and salting trends have been detected during the second half of the XX and its relevant impact on the overturning circulation of the Mediterranean Sea and more likely its remote influence on the North Atlantic MOC through MOW.

For all these reasons that the results of this paper could be very interesting for the oceanographic communities and in particular for those more implicated in the Mediterranean study. Therefore I recommend this paper to be published, but major revision and other minor ones is necessary before to be published, for the following reasons:

Because the phenomena described in the paper is very complex and the analysis performed isn’t completely adequate I have some suggestions for the authors that can improve significantly the physical paper value:

1) EOF analysis could be applied to the potential temperature, salinity of the Dyfamed data to study the spatial and temporal distribution of the leading modes in order to observe and monitoring the DW events, through for example the degradation of the vertical mode in time and space. This analysis could be useful to learn more about the observed interannual variability and eventually its link with the different distribution of the variance (spatial and temporal), afterword they can also link that evolution to the computed dynamical stability analysis (Brunt-Vasala N^2) of the water column;

2) analysis of the feedbacks: in general the major deficiency of this paper is the explanation of dynamics process underneath the observed variability of the DYFAMED data set. In fact, the authors have to be spent more attention on the discussion about the advection-convection feedback under the strong variability of the external atmospheric forcing, including a more accurate discussion on the abrupt freshwater deficiency observed in the observed period and the salt water advection at the intermediate level (LIW anomalies including the fundamental role of EMT), see as references: Wu, P. and K. Haines, Modeling the dispersal of Levantine intermediate water and its role in Mediterranean deep water formation”, J. Geophys. Res., 101, 6591-6607,1996; V. Artale et al.; The role of surface fluxes in OGCM using satellite SST. Validation and sensitivity to forcing frequency of the Mediterranean thermohaline circulation, J. Geophy. Res C, Vol. 107, no. C8, 10.1029/2000JC000452, 2002; M. Herrmann et al., Modelling the deep convection in the Northwestern Mediterranean Sea using an eddy-permitting and eddy-resolving model: case study of winter 1986-1987, JGR, 2007;

3) remote control of the wind and its relevance to the large-scale oceanic circulation,

following the paper of F. Straneo (On the Connection between Dense Water Formation, Overturning, and Poleward Heat Transport in a Convective Basin, JPO, Vol.36, 1822, 2006) in which the model described in this paper highlights the role of the wind-driven circulation in affecting the net sinking of dense water in a convective basin: a faster remotely forced circulation implies less sinking for the same amount of dense water formed due to the increase of the mesoscale and turbulence activities and the intensification of eddies exchange between the border of the convective chimney and consequently a faster restratification of the interior with less vertical ventilation. Therefore the eddies activity, induced by the wind stress, can modulate the time-scale of the cycle of convection and restratification. The cycle of convection and restratification, that is well discussed in the papers of Marshall and Shott and Straneo, isn't taken in consideration in the present manuscript for understand /describe the interannual variability (please discuss this point at the beginning of the Introduction);

4) impact of the different path of LIW (this is partially discuss in the paper) on DW formation: The Gulf of Lyon and the Ligurian Sea are a sink in which we have a convergence of different water mass with different trajectories and origin or source. The LIW, defined as a main source of salt water for the entire Mediterranean Sea, play from a dynamical point of view, the same role of MOW in the North Atlantic contributing similarly to increasing the variability of THC and therefore the DW formation through a production of the advection-convection feedback. Moreover the local dynamics in the DYFAMED area depends also from the water advected from the Liguro Provencale circulation (see Millot, Circulation in the western Mediterranean Sea, J. of Marine System, 20, 423, 1999), as discussed very well by the authors; but more remotely the advection also depends from the interaction with Tyrrhenian sea though the Corsica channel and finally from the remote influence of the Levantine basin though the Sardinia channel and in my opinion also from the Gibraltar strait that for Mediterranean sea is the principal source of fresh water (see G. Sannino et al., An eddy-permitting model of the Mediterranean Sea with a two-way grid refinement at the Strait of Gibraltar; Ocean Modelling, Volume 30, Issue 1, Pages 56-72, 2009). In conclusion we have different remote source of variability with different time scale (see Artale et al. fig 92 of this book for what regarding the different time-scale of LIW path in WM:The Atlantic and Mediterranean Sea as connected systems. In: P. Lionello, P., Malanotte-Rizzoli & R. Boscolo (Eds), Mediterranean Climate Variability, Amsterdam: Elsevier, pp. 283-323; 2006), can do the authors some analysis to distinguish the different origin of the salt that take part on the DW events?

5) influence of the external fluxes (heat and E-P) in relation with evolution of thermocline feedback between external atmospheric forcing (including extreme events) and the salt accumulation at the intermediate layer; this feedback could be at the origin of the catastrophic event in winter 2004-2005, in which the complete mixing of the entire water column was observed.

In conclusion I propose to take in serious consideration all the above suggestions, in particular point 1 that can be introduced in section 3; all the rest of the points may help to give a fingerprint of (or at characterize) each DW event for the overall period and could be useful for the attribution at each of these phenomena a prevalent contribution of one particular mechanisms or the other one in order to explain with more details the observed variability.

Minor corrections

a) the authors have to compare their results with those of Marty et al., 2002, which found that at DYFAMED, the maximum deepening of the ML and the beginning of the vertical mixing in the surface layer occur respectively in January–February and in November.
b) in tab.7 indicate as you compute explicitly the probability that convection reach some depth
c) equation 2 cut one parentis