

LONG LIFE FOR THE EASTERN MEDITERRANEAN MESOSCALE EDDIES

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Abstract

The three-dimensional structure of the eastern Mediterranean mesoscale eddies was studied using a combination of a high horizontal resolution numerical model (~5 km) outputs, in-situ and satellite data. Most of these eddies show good similarity between model results and observations. The structure, formation, development and propagation of each feature were studied separately and the results were then compared. Westward propagation in the southern Ionian Sea and eastward propagation in the southern Levantine Basin were observed with lifetime of more than two years.

Keywords : *Eastern Mediterranean, Ionian Sea, Levantine Basin, Mesoscale Phenomena, Circulation Models.*

Introduction

The POEM program [1] was the first to highlight many stationary and permanent mesoscale eddies in the eastern Mediterranean Sea (EMed). Recently, the propagation of these eddies was well documented using SST-VHRR imagery [2]. For the first time authors observe the southward propagation of the Ierapetra eddy and the eastward propagation of eddies in the southern Ionian Sea (S-IS) and southern Levantine Basin (S-LB). Our analysis of a 24-year simulation [3] focuses on the mesoscale activity in four key areas of the EMed (Pelops, Ierapetra, S-IS and S-LB) (Fig. 1a, b).

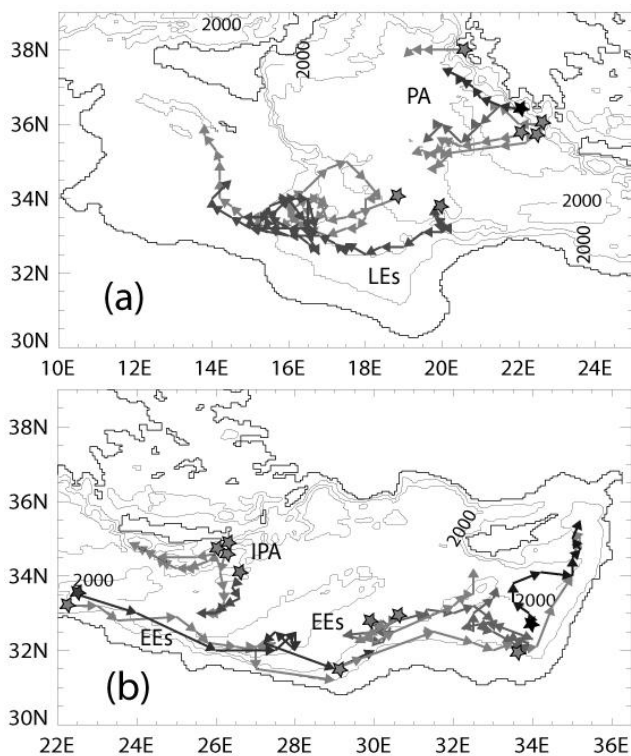


Fig. 1. a. IS eddy trajectories: Pelops Anticyclone (PA), Libyan Eddies (LEs), b. LB eddy trajectories: Ierapetra Anticyclone (IPA) and, Egyptian eddies (EEs).

Results and discussion

Ionian Sea: We call the S-IB eddies (below 35°N) Libyan Eddies (LEs). The LEs have a diameter of 75-150 km and a vertical extension of 1000 meters. Maximum swirl speeds reach ~80 cm/s and their propagation speeds are of ~1-2 km/day. Surprisingly and contrary to what we previously believed, the LEs are generated in the south-eastern part of IS and they propagate westward (Fig. 1.a) [Recently observed by EGYPT program, personal comm.]. LEs lifetime can reach 2 years [3]. Pelops Anticyclone (PA) displays the smallest diameter of 50-75 km and the deepest vertical extension of 2000 m in good agreement with the literature. The PA is generated in summer or autumn, which supports the consideration

of wind-induced eddy. Depending on its generation position, it propagates northward or westward and its lifetime varies from 3 to 18 months.

Levantine basin: The most striking feature, which the model reproduces, is Ierapetra Anticyclone (IPA) of 75-150 km diameter and vertical extension of 1000 m. It seems to be generated by the Etesian winds in late summer. IPA lifetime is ranged from 4 to 11 month. Its propagation paths (Fig. 1b) are in good agreement with SST-AVHRR observations [2]. We call the S-LB eddies Egyptian Eddies (EEs). The EEs can reach 250 km of diameter and swirl speeds of about 50-100 cm/s. Their vertical signatures are limited to the upper 700 m depth. Tracking EEs shows eastward propagation (Fig. 1b) with speeds of 1-2 km/day and lifetime ranged from few months to about one year.

Conclusion

The model resolution allowed us a detailed investigation of the mesoscale eddies in the EMed. The eddy characteristic analysis reveals a good similarity between the model results, the SST (AVHRR) images and in situ measurements.

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References

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