

THE HELLENIC ARC, A KEY TO THE KINEMATICS
OF THE EASTERN MEDITERRANEAN SINCE 13 MILLIONS YEARS

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RESUME

Des considérations géophysiques et néotectoniques nous conduisent à proposer une reconstitution des mouvements relatifs et des déformations depuis le Pliocène supérieur dans les régions égéennes et péri-égéennes (+). Cette reconstitution est fondée sur l'estimation des mouvements Arc Hellénique-Afrique (subduction hellénique), Arc Hellénique-Europe (lié à l'expansion égéenne et au rapprochement Afrique-Europe) et Europe-Turquie, qui permettent une reconstruction de l'Egée (fig.1) vers 13 M.a. (Miocène moyen à supérieur), compatible avec les données néotectoniques. Une récente campagne de bathymétrie fine (Rayon de Mer) du N.O. J. Charcot (++) renforce l'interprétation cinématique proposée quant au mouvement à la frontière des fosses helléniques (subduction frontale à l'Ouest, décrochement dominant à l'Est).

ABSTRACT

We make a quantitative estimate of the relative motion between the Hellenic Arc and Africa, using the focal mechanisms of the shallow earthquakes along the arc and the extent of the intermediate seismic belt, as well as the general pattern of the trench. Frontal subduction occurs in the Ionian Trenches, while the motion is principally transform in the Pliny and Strabo Trenches. We then evaluate the deformation in the Aegean area, using neotectonic and geophysic data while taking into account an estimate of the relative motions occurring between the Hellenic arc and Africa, and the Hellenic arc and Europe (our model accomodates Aegean expansion by normal faulting), and Turkey-Europe motion along the North Anatolian Fault.

We propose a reconstruction of the pattern of motion over the Eastern Mediterranean region for the last 13 M.y. approximately (Middle-Late Miocene) (+). Its main feature is that Aegea has been spreading outward in front of the southwestward advancing Turkey. Fig.1 summarizes the distribution of deformation in the Aegean area : it shows the actual amount of deformation necessary to go from the present back to the 13 M.y. model. Circles, originally inscribed in the squares of a E-W and N-S grid applied to the present, are transformed into ellipses the axes of which indicate the principal directions of strain (inverted since we proceed backward in time) : Aegea was dominated by extension in the South (crosses), whereas E-W contraction has accompanied N-S extension in the North (stippled), thus resulting in extension and strike-slip. Note the amounts of rotation involved in the model

A recent detailed bathymetric survey of R.V. J. Charcot, using a multi-narrow beam sounder (Seabeam) has provided support to our interpretation (++).

(+) X. Le Pichon and J. Angelier, The Hellenic Arc and Trench system : a key to the neotectonic evolution of the Eastern Mediterranean area, Tectonophysics, sous presse.

(++) X. Le Pichon *et al.*, From subduction to transform motion : a seabeam survey of the Hellenic Trench system. Abstract, same Committee, XXVI^e Congrès Ass.plén. C.I.E.S.M.

XXVI^e Congrès-Assemblée plénière d'Antalya, 24 novembre-2 décembre 1978
The Hellenic Arc, a key to the kinematics of the Eastern Mediterranean since 13 millions years. Jacques Angelier et Xavier Le Pichon.

FIGURE 1

