

# Clay minerals in the Northern Adriatic Sea : dispersal by drift currents

by

LUCIANO TOMADIN

*Laboratorio di Geologia Marina, C.N.R. Bologna (Italia)*

## Abstract

The Po River is the main source of clay sediments in the Northern Adriatic Sea. An eastward surface flow from the Po River Delta meets a drift current from the South. The finest suspended material is therefore shifted in such a way that the sediments near the coast of Istria are lacking in smectite. This mineral concentrates in the central part of the basin.

## Résumé

La source principale des minéraux argileux dans la mer Adriatique est le Pô. Un flux superficiel vers l'Est de matériel en suspension rencontre un courant de dérive provenant du Sud. Les matériaux pélitiques les plus fins sont déplacés d'une façon telle que les sédiments le long de la côte d'Istrie sont privés de smectite et l'on observe un dépôt de ce minéral dans la partie centrale du bassin.

\* \*

On the basis of smectite occurrence two mineralogic provinces have been recognized (fig. A) in the Northern Adriatic Sea [1] [2]. The dispersal of the clay minerals close to the Po River Delta [3] shows evidence of a selective transport towards the open sea and of a drift current action. Bottom samples, collected in central section of the basin, were analyzed by X-ray diffraction for the clay mineral distribution and for the influence of dynamic agents. The analytical data were compared with those obtained in other areas [4, 5]. The clay mineral assemblage observed in the Northern Adriatic Sea consist of illite and smectite (accounting for 70-80 % of the total), with minor chlorite, kaolinite and traces of serpentine. The compositions of the fluvial clays [6] and the smectite distributional pattern (fig. B) point out a main " Padan Source " for this mineral, which is concentrated in a central belt.

High illite content characterizes the coastal sediments of the Northern Adriatic Sea, in agreement with mineralogy of the river supplies. The illite pattern (fig. C) emphasizes the Po River as the main source of the clays. The decrease of the illite in the central basin gives evidence of a significant southward transport. The chlorite distribution (fig. E) is similar to that of illite and has the same detrital origin. Kaolinite concentrates (fig. D) in the near-shore sediments of the Po River Delta [3] and mainly along the Istrian coast, where it can be correlated [7] with the red soils (" terra rossa ").

The dispersal of clay minerals in the sediments can be explained as follow. The finest suspended material (mainly smectite) is carried away from the Po River Delta by an eastward flow of surface waters (fig. A). 20-30 km before reaching the Istrian coast this flow meets the drift current from the South [8]. Consequently, the deposition of smectite is shifted, thus this mineral is absent in the nearshore sediments of the Istrian coast (see the " illite province ").

The greatest amount of smectite occurs in the central part of the Northern Adriatic Sea in areas where the westward spreading saline waters (fig. A) meet southward moving waters freshened by river outflow. The latter drift current flows along the Italian coast and carries down the Adriatic Sea the main suspended load supplied by the Po River.

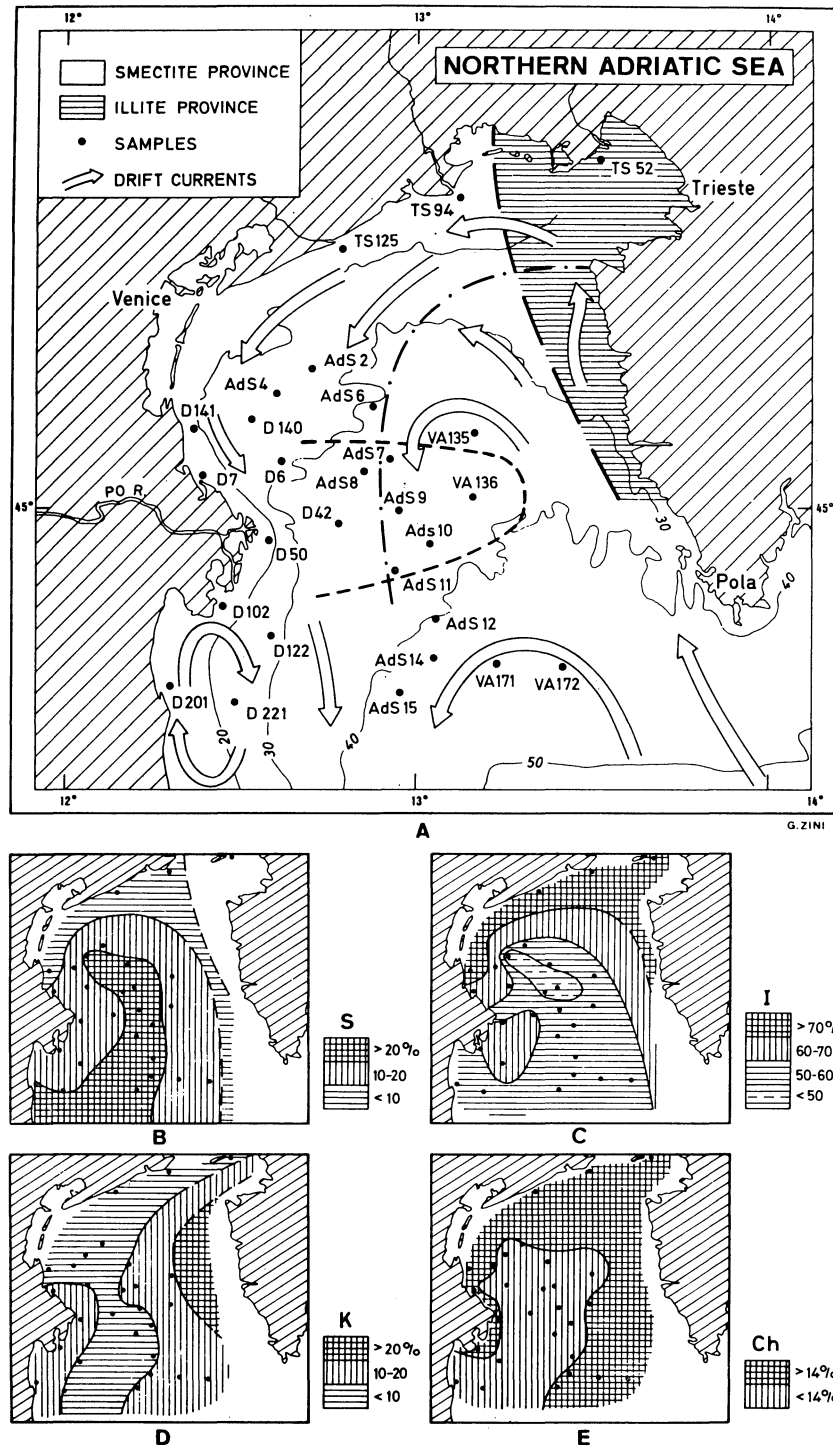


FIG. A — Main clay mineral provinces and influence of dynamic agents in the Northern Adriatic Sea (Drift currents after NELSON, 1970; range of Po River influence — short dashed line — after JERLOV, 1958; contact between westward-spreading waters and southward moving waters — lines and dots — after MOSETTI, 1967).  
 FIG. B, C, D, E — Smectite (S), Illite (I), Kaolinite (K), Chlorite (Ch) distribution in the bottom sediments.

## References

- [1] BRAMBATI (A.), 1968. — Mixing and settling of fine terrigenous material ( $< 16 \mu$ ) in the Northern Adriatic Sea between Venice and Trieste. *St. Trent. Sc. Nat.*, **45**, pp. 103-117.
- [2] PAUL (J.), 1970. — Sedimentologische Untersuchungen im Limski Kanal und vor der istrischen Küste (nördliche Adria). *Göttinger Arb. Geol. Paläont.*, **7**, 75 p.
- [3] TOMADIN (L.), *in preparation* — Clay mineralogy of the recent sediments close to the Po River Delta.
- [4] BRAMBATI (A.), 1972. — Clay mineral investigation in the Marano and Grado Lagoons (Northern Adriatic Sea). *Boll. Soc. Geol. It.*, **91**, pp. 315-323.
- [5] VENIALE (F.) *et al.*, 1973. — Clay mineralogy of bottom sediments in the Adriatic Sea. *Proc. 1972 Intern. Clay Conf.* pp. 249-258.
- [6] TOMADIN (L.), 1969. — Ricerche sui sedimenti argillosi fluviali dal Brenta al Reno. *Giornale di Geol.*, **36**, pp. 159-184.
- [7] HINZE (C.) & MEISCHNER (D.), 1968. — Gibt es rezente rot - sedimente in der Adria? *Marine Geologie*, **6**, pp. 53-71.
- [8] NELSON (B.W.), 1970. — Hydrography, sediment dispersal and recent historical development of the Po River Delta, Italy. In : *Deltaic sedimentation, modern and ancient*. Morgan J. Ed. pp. 152-184.
- [9] JERLOV (N.G.), 1968. — Adriatic thalassographic Cruise 1955. II. Distribution of suspended material in the Adriatic Sea. *Archivio Ocean. Limnologia*, vol. XI, **2**, pp. 227-250.
- [10] MOSETTI (F.), 1967. — Considerazioni preliminari sulla dinamica dell'Adriatico settentrionale. *Archivio Ocean. Limnol.*, vol. XV, suppl., pp. 237-244.

