

## **Serravallian and Tortonian GSSP Working Group meeting, May 14-16, 2002**

A meeting of the SNS Working Group on defining GSSPs for the base of the Tortonian and Serravallian was held at the Geological Observatory of Coldigioco on May 14-16, 2002. The participants arrived on May 14 in the late afternoon, presentations and discussions were held on May 15 and a boat-trip to the coastal cliffs of Ancona and Monte dei Corvi in particular was made on May 16.

Participants: Silvia Iaccarino, Elena Turco and Fabrizio Lirer (Parma), Isabella Raffi (Chieti), Rodolfo Sprovieri (Palermo), Nick Shackleton (Cambridge), Alessandro Montanari (OGC) and Frits Hilgen (all WG members except FL).

WG meeting presentations:

### **Historical background**

*Silvia Iaccarino*: Historical background of the Tortonian and Serravallian stages.

### **Calcareous plankton biostratigraphy and -chronology**

*Elena Turco*: Middle-Late Miocene planktonic foraminiferal biostratigraphy and -chronology with a focus on the Serravallian/Tortonian and Langhian/Serravallian boundaries.

*Fabrizio Lirer*: Middle-Late Miocene planktonic foraminiferal biostratigraphy and -chronology of the Tremiti Islands and DSDP Site 372.

*Isabella Raffi*: Middle-Late Miocene calcareous nannofossil biostratigraphy and -chronology with a focus on the Serravallian/Tortonian and Langhian/Serravallian boundaries.

### **Potential candidate sections for defining the Tortonian GSSP**

*Rodolfo Sprovieri*: Integrated stratigraphy and astronomical tuning of potential boundary stratotype sections in southern Italy and on Malta.

*Alessandro Montanari*: Integrated stratigraphy and astronomical tuning of the Middle-Upper Miocene at Monte dei Corvi.

*Frits Hilgen*: Integrated stratigraphy and astronomical tuning of the Middle-Upper Miocene at Monte Gibliscemi, Monte dei Corvi and on Tremiti islands.

### **The open ocean perspective**

*Nick Shackleton*: Integrated stratigraphy and astronomical tuning of the Middle-Upper Miocene in the open ocean record of Ceara Rise (equatorial Atlantic).

*Members of the WG enjoying a perfect lunch at Portonovo with a nice view on Monte dei Corvi.*

*Panoramic view of the Travi cliffs south of Ancona. The Monte dei Corvi section can be seen on the right side.*

## Discussion

The discussion on the Tortonian GSSP initially focussed on the most suitable (multiple) criteria to define the boundary. According to the historical stratotype sections, the boundary should be defined somewhere in the interval between the *Calcidiscus praemacintyreii* LCO (= top Serravallan type section, Rio et al., 1997) and the *Neogloboquadrina acostaensis* FCO (= base Tortonian type section, Hilgen et al., 2000). However, the use of calcareous plankton biohorizons as boundary markers in this interval is complicated due to the often strong diachroneity of the events involved. Candidate sections are the Gibliscemi and Casa Pelicana sections on Sicily (southern Italy), the Monte dei Corvi section in northern Italy and the San Nicola section on Tremiti islands (Adriatic Sea, Italy).

Three alternative options for the boundary level were discussed:

- 1) to place the boundary coincident with the FRO of *N. acostaensis* dated astronomically at 10.544 Ma in section Gibliscemi. The main reason for this option is that in that case the boundary closely coincides with the base of the Tortonian in the historical stratotype section of Rio Mazzapiedi. The boundary would approximately coincide with a major turnover in the calcareous nannofossils marked by the appearance of the five-rayed discoasters (*D. bellus* group) in the low latitude ocean. This event however is delayed in the Mediterranean where in addition the species is very rare. The boundary would also closely coincide with the appearance of *Hipparion* on the Indian subcontinent. Disadvantages are the absence of magnetic reversal boundaries in the middle of the long normal of C5n.2n and the lack of synchronous calcareous plankton bioevents between the low-latitudes and the Mediterranean type area.
- 2) to place the boundary at or close to the base of the long normal interval of C5n.2n. This reversal has been dated astronomically at 11.043 Ma in the continental section of Orera in Spain but has thusfar not been pinpointed in tuned marine successions due to adverse magnetic properties. The boundary would coincide closely with the *Hipparion* FO in Europe but no distinct "globally synchronous calcareous plankton events are available.
- 3) to place the boundary at or close to the *Discoaster kugleri* LCO and *Globigerinoides subquadratus* LCO dated astronomically at 11.604 and 11.539 Ma, respectively in section Gibliscemi. The *Discoaster kugleri* FCO and LCO from a calcareous nannofossil point of view and the *G. subquadratus* LCO from a planktonic foraminiferal point of view can be considered - on the basis of the existing astronomical age models - to be synchronous between the Mediterranean and the low-latitude open ocean. The *D. kugleri* LCO is a very suitable criterion to distinguish the boundary because it coincides approximately with the *G. subquadratus* LCO and is closely linked to the short normal subchron C5r.2n in the North Atlantic. In addition, the event coincides closely with or directly precedes the Mi-5 isotope event and the associated glacio-eustatic sealevel low (TB3.1) and deep-sea hiatus NH4. The dispersal of the *Hipparion* ancestor from North America seems to be linked to the same chain of events (Garces et al., 1997).

After a short discussion the members of the WG unanimously agreed that option 3 is the preferred one especially because of its high correlation potential using multiple techniques. From all candidate sections, Monte dei Corvi was considered the most suitable section for defining the Tortonian GSSP despite the lack of a reliable magnetostratigraphy and the often poor preservation of the calcareous plankton. It is the only section which has been astronomically dated and contains a continuous succession in the boundary interval. The section can be cyclostratigraphically correlated in detail to parallel sections on Sicily (Gibliscemi, Casa Pelicana) and the Tremiti Islands (San Nicola).

Rodolfo Sprovieri suggested to define an auxiliary boundary stratotype at Monte Gibliscemi to overcome the problem of the poor preservation of the calcareous plankton

and the lack of a reliable stable isotope record. This suggestion was unanimously agreed upon.

The Monte dei Corvi section located close to Ancona was visited on May 16 and the temporary GSSP was provisionally placed in the middle of the sapropel of cycle 76 in the beach section, approximately two meters above the Ancona ash bed. It was agreed upon that a proposal for the Tortonian GSSP will be written by Silvia Iaccarino and Frits Hilgen before the end of 2002 and submitted early 2003.