(Ménard & Molnar 1988), then thinned again during the Mesozoic development of Tethys and its passive margin (Trümpy 1980).

The western European rift system initiated on these ancestral, mostly NNE–SSW orientated faults in the late Eocene (Rigassi 1977b; Bergerat 1987; Bergerat et al. 1990). These opened up under E–W extension during the Oligocene, producing a series of salt basins from the southern Rhine graben to the southern Rhône valley (Rat 1978; Debrand-Passard & Courbouleix 1984; Ziegler 1988). In particular, the Bresse graben structures extended southwards into the Rhône-Alp region (Bergerat 1987). The normal faults cutting basement and Palaeogene cover in the Rhône-Alp region have also been explained as due to outer-arc extension associated with flexure of the European plate (Mugnier & Ménard 1986) in much the same manner as recently suggested by Bradley & Kidd (1991). From the late Oligocene, WNW-directed convergence (Dewey et al. 1973; Ricou & Siddans 1986; Gillcrist et al. 1987; Vialon et al. 1989) incorporated Helvetic flysch and Lower Freshwater Molasse (Chattian-Aquitanian) into the Subalpine thrust sheets (Masson et al. 1980; Doudoux et al. 1982; Tardy & Doudoux 1984). In the Subalpine massifs, the Burdigalian OMM is found locally unconformably overlying deformed Aquitanian molasse, suggesting that the latter was deposited in piggy-back basins during active shortening (Mugnier & Ménard 1986). In a more external position in the Rhône-Alp region, the NNE–SSW trending (?normal) faults affect Oligocene to Aquitanian deposition, and also affect marine facies and sediment dispersal in the Burdigalian. Whether by this stage the faults had already undergone inversion during Alpine compression is not known. By the late Burdigalian the fault-related palaeohighs had been buried by the marine sediments of the peri-Alpine seaway. This is clearly a very different scenario to that envisaged for the North Alpine Foreland Basin in Switzerland (Pfiffner 1986; Homewood et al. 1986; Sinclair et al. 1991; Allen et al. 1991), where flexural subsidence dominated other effects from the late Eocene onwards. The Rhône-Alp region therefore occupies a pivotal position between the Rhine-Bresse-Rhône rift system and the peripheral foredeep of the Alps.

6. Conclusions

1. The Upper Marine Molasse (OMM) in the Rhône-Alp region spans the time interval from early Burdigalian to Serravallian, a period of about 10 My entirely within the Miocene. The maximum thickness preserved is 1150 m, representing a sediment accumulation rate of just over 0.1 mm y^{-1} ignoring post-Miocene compaction.

2. The early Burdigalian seaway was established by the flooding from the south of a number of narrow N–S or NNE–SSW orientated continental basins related to late Eocene-Oligocene extension in the Rhine-Bresse-Rhône system. The oldest deposits are large scale subtidal sandwaves which migrated towards the south and SW, that is, towards the entrance of the tidal strait. Subsequently, a tide-dominated coastal tract prograded westwards into the basin from the Alpine flank, while condensed shelly limestones accumulated against a quiet rocky shore in the west. By the mid-Burdigalian the N–S orientated palaeohighs had been buried by marine deposits of the peri-Alpine seaway. The mid-late Burdigalian was a period of low-energy conditions associated with a muddy shelf that became sandier towards the eastern, Alpine coast. The remainder of

the Miocene into the Serravallian was characterized by the progradation of thick sandy wedges from the Alpine mountain belt into the seaway. An initially fine-grained tidal coastline was replaced by a conglomeratic marine fan-delta as the entire basin was translated westwards to the edge of the Massif Central.

3. The Miocene stratigraphy can be divided into two main stratigraphic sequences (*s. l.*), each with a major surface of marine onlap at its base. The first sequence, from early to late Burdigalian (21–23 Ma to 16.5–17.5 Ma), is found in the east of the study area, principally in the Chambéry, Rumilly and Novalaise Synclines. The top of the sequence (late Burdigalian) is marked by muddy shelf conditions and 7 km of offlap at the western margin of the basin. This is thought to have been associated with basin narrowing. The second sequence, from latest Burdigalian/early Langhian to Serravallian (16.5–17.5 Ma to 12–15 Ma) is recognized by rapid marine onlap towards the west of tidal deposits over Mesozoic basement, the western edge of the basin reaching as far west as the stable margin of the Massif Central. Encroachment of the sediment-nourished Alpine margin caused a major coarsening-up trend to develop. The precise linkage of stratigraphic history to events in the orogenic wedge has not yet been developed.

Acknowledgements

JPB carried out this work during his tenure of a NERC research studentship. Advice was gratefully received from Jacques Perriaux (Grenoble) and Marc Tardy (Chambéry). The manuscript has been improved by the comments given by Tom Martel and Sanjeev Gupta (Oxford), Hugh Sinclair (Durham), Jean-Pierre Berger (Fribourg), Christian Beck (Chambéry) and Walter Wildi (Genève), and journal reviewers Albert Matter (Bern) and Jean-Louis Mugnier (Grenoble). Claire Carlton and Andrew Clark are thanked for the artwork.

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