IAS/SEPM International Symposium on Foreland Basins, Fribourg, Switzerland, 2-4 Sept 1985, Programme & Abstracts, p. 101

Subduction tectonic erosion (STE) of the South Alpine plate, essential preliminary to nappe genesis and tectonics in the Alps, and key control upon earlier Alpine foredeeps

Miles F. Osmaston
The White Cottage, Sendmarsh, Ripley, Woking, Surrey GU23 6JT,UK

Fault structures (steps and graben), seen to develop on subducting plates where they bend down into the BeniofF zone, can erode not only the edge of the forearc but also its underside, so that the line of plate downturn gradually advances at shallow depth beneath the forearc. Such STE will become effective if an accretionary complex first builds out beyond the zone of downturn faulting, so that sedimentation can no longer clog the erosive profiles. Both off NE Japan and under NE New Zealand downturn advance now exceeds 200km, at a dip of 5°- 15°. Beneath western USA in the late Cretaceous downturn advance may have approached 1000km. Thus STE, in carving away the lower part of the basement of of the extended forearc, turns it into a huge basement thrust sheet, solving the the otherwise intractable problem of how such sheets are detached from their bases.

In the Alps, the Austroalpine sheets, the Penninic basement nappes and the main ophiolite bodies (e.g. Platta) appear to have been undercut in this way as a single sheet by southward subduction during Barremian(?)-Cenomanian time. The initial subduction line lay (50km?) north of the southern margin of the ocean. As the undercutting progressed, the underside of the sheet was "buttered" with a sheared mixture of of ophiolitic, pelagic and other material imported by the subducting plate, plus some upper-plate material detached and carried along by it. Apparently, rupture of the sheet and the stacking of its parts beneath one another, during continuing subduction, was episodic from Cenomanian to Eocene, starting in the southern part (edge of Northern Calcareous Alps), then jumping northward to various sites within the partly-overridden northern part.

As each (buttered) part was dragged was dragged into the subduction zone, cocooned in more butter, and lodged just short of the downturn line, it suffered a similar but separate sequence of deformation. Thus it is argued that the Tethyan ocean lay exclusively in the Valais/North Penninic position, but the instantaneous foredeep (and its related sedimentation and tectonism) jumped about, with intervening reversions to the northermost (oceanic) site and accretionary prism, which was finally overridden also. Controls for this scheme of events will be drawn from various substrate-conglomerate-flysch occurrences.