# Melting the hydrothermally altered sheeted dike complex: Chemical composition of the main MORB crustal contaminant

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Recent studies on fossil (Oman ophiolite) and modern oceanic crust (IODP Hole 1265D) shed light on interactions between the magmatic and the hydrothermal systems at fast spreading ridges [1, 2]. It is shown that the interface between the mostly liquid melt lens and the sheeted dike complex (SDC) is a dynamic system; the top of the melt lens can migrate vertically with the potential to reheat, to trigger hydrous partial melting, and to assimilate the hydrothermally altered SDC. It is proposed that the occurrence of recrystallized granoblastic dikes and plagiogranitic intrusions at the base of the SDC results from these processes. The newly formed hydrous melt represents the main crustal contaminant for the MORB-type melts filling the melt lens.

To test this model, we performed hydrous partial melting experiments using an IHPV under conditions (P-T, redox) that match those prevailing at the base of the SDC, and using a natural, fully altered diabase as starting material. Major and trace element compositions of experimental melts & minerals are compared to those of natural plagiogranites and of granoblastic dikes.

Generated melts are water saturated, transitional between tholeiitic and calc-alkaline, and match the compositions of plagiogranites intruding the base of the SDC. Newly crystallized minerals have compositions that are characteristic of granoblastic dikes. REE and other trace element contents match those of natural oceanic plagio-granite. Analyses of the degassed experimental products allow us discussing the fluid affinity of various elements.

Our studies demonstrate that hydrous partial melting is a likely common process at the base of the SDC, starting at temperatures above 850°C. It supports a residual origin for granoblastic dikes, an anatectic origin for the associated plagiogranites, and it is consistent with dynamic models for the magmatic / hydrothermal transition. Hydrous partial melting must play a significant role in the contamination and geochemical variability of MORBs.

[1] Koepke *et al*. (2008) doi:10.1029/2008GC001939.
[2] France *et al*. (2009) doi:10.1029/2009GC002652

# Mountain versus floodplain weathering: Example of the Himalayan basin

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Mountain building is generaly considered as a triggering factor of weathering as steep slopes promote physical erosion creating reactive surfaces that tend to facilitate weathering. On the other hand, mountains also promote fast transport that reduces particle residence time and therefore limit reaction. Here we present an analysis of modern river sediment compositions from the Ganga river basins in Himalaya and the Ganga floodplain. River sediment geochemistry is compared to average source rocks in the Himalaya tacking into account their variability. River sampling allows to track the evolution of sediment geochemistry from the head basins in Himalaya throughout their course in the floodplain. Sampling also includes depth profiling of the river sediments that reflect the effects of mineralogical sorting. This tend to enrich surface suspended load in fine grained / clay rich particles whereas bed-sediments tend to concentrate in coarser and quartz rich particles, the fine grain end-member being the most sensitive to weathering. The data show a clear depletion in mobile elements such as Na and K from sources to the Bangladesh delta while Ca and Mg chemistry is dominated by carbonate dissolution. The budget is however hampered by sources effects such as input from (1) southern tributaries of the Ganga that are originaly very depleted in Na and K or (2) the Siwaliks sediments, i.e. former floodplain sediments, that are strongly depleted in Na. Taking into account these sources allows to refine the distribution of weathering. Consistently with the trends observed on dissolved river chemistry, Na is the main species released from silicate weathering in the basin. Comparison of Himalayan river sediments with source rocks from either High Himalaya of Lesser Himalaya (LH) suggest that there is no detectible losses in K during mountain weathering. For Na the budget is more difficult as LH formation is more depleted in Na than river sediments. Depending on proportion of LH in the source rocks, the apparent Na leaching in the mountain environment represent 15 to 0% of the initial content. Floodplain leaching is much more intense and about 50% Na and 30% K is lost in this compartment. The floodplain may appear less favorable to weathering than the mountains as water availability and drainage are lower. On the other hand temperature and long residence time in the floodplain favour more intense weathering than in the mountains.