Subduction and Exhumation of the Tso Morari Region, Ladakh

1) Introduction

- The Tso Morari dome is the northernmost extent of Indian continental crust subducted to UHP conditions during early India-Asia collision
- The discovery of the mineral coesite, a high pressure polymorph of quartz, is evidence for continental subduction to pressures of around 27kbar (~90km)
- The abundant felsic material has been overprinted by amphibolite facies metamorphism and retains little evidence of high pressure metamorphism

2) Key points

- Mafic eclogites preserve evidence for UHP metamorphism. They comprise <1% of the outcrop and have >90% of publications.
- 99% of the material is felsic with very few publications.
- The felsic material records amphibolite facies metamorphism, with little evidence of high pressures

3) Outcrop relationships

- Metasedimentary raft and intrusive contact with granite gneiss.
- Eclogite boudins hosted in granite-mica-schist (igneous protolith).
- Lithologies making up the dome include: metagranites, metasediments and metabasic rocks

4) Undefomed granite

- Evidence of high pressure metamorphism is preserved as coronas of garnet and phengite around igneous biotites and within cordierite pseudomorphs

5) Prograde garnets

- Garnets are found in mica gneisses close to shared rhombohedral contacts.
- Garnets with remarkable similarity to prograde garnets (left). It is in the high-Mg rims of the eclogites
- Garnets with remarkably similar textures and garnet cores (right). These garnets preserve prograde conpositional zoning (left). The zoning pattern in the Mg and Ca is remarkably similar to the zoning pattern in the mafic eclogites (right).

6) Conclusions and Implications

- Eclogite facies metamorphism is preserved in the metagranites of Tso Morari dome, as well as in eclogite boudins

7) Further work

- Determine the P-T-t history of the UHP eclogites across the dome
- Compare P-T paths of different lithologies
- Determine the involvement of water through time

How do you turn a granite into a garnet mica schist?

How do large thrust slices of continental crust, composed mostly of Ordovician granite get subducted to depths >100 km and then returned to the surface during the India-Asia collision process?