

Dehydration of warming serpentized forearc mantle: implications for exhumation of HP/UHP metamorphic belts

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Recent geophysical evidence shows that a wedge shaped region of serpentized mantle occurs in the cold, shallow forearc mantle above dehydrating slabs in several well-studied subduction zones. The volume of water potentially stored in the forearc is huge, about 200-400 km³/km of margin, depending on the degree of serpentization of the forearc mantle. Dehydration occurs from the serpentized forearc mantle in active subduction zones as the age of the subducting plate becomes younger or in relict forearcs after subduction ceases. We propose that many large continental strike-slip fault systems are mobilized and exhumation of high/ultrahigh-pressure metamorphic belts is rheologically facilitated by a single fundamental process: weakening due to the release of pressurized water from the serpentized forearc mantle. This process may also apply to the formation of some plate boundaries in intracontinental suture zones and passive margins. Dehydration weakening of former forearcs might, therefore, make such regions prone to strain localization, orogenesis and plate boundary formation, and hence be a very important process in Earth's tectonic history.