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Ascent paths of fluids and partial melts at the Sunda Arc compared with other subduction zones by geophysical parameters

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During the last decades many investigations were carried out at active continental margins to understand the link between the subduction of the fluid saturated oceanic plate and the process of ascent of fluids and partial melts forming a magmatic system that leads to volcanism at the earth surface. With seismic methods the physical structure of the down going slab and the part above it can be resolved. In particular the record of the natural seismicity and its distribution allows the three-dimensional imaging of the entire crust and lithosphere structure above the Wadati Benioff zone with the help of tomographic procedures, and therewith the entire ascent path region and reservoirs of fluids and melts, which are responsible for volcanism.
If we consider statistically the distance between the volcanic chain at the earth surface down to the subducted plate and the Wadati Benioff zone then the mean value of the depth distance results of approximately 110 kilometers. Surprisingly, this depth range shows pronounced seismicity at most of all subduction zones. Additionally, mineralogical investigations in the lab have shown that the diving plate is maximal dehydrated around the 100 km depth because of temperature and pressure conditions at this depth range. However, assuming a vertical fluid ascent there are exceptions. For instance at the Sunda Arc beneath Central Java the vertical distance results in approximately 150 km, but, seismic investigations have shown that here the fluids do not ascend vertically, but inclined even from a source area at around the 100 km depth. With the seismic tomography areas where fluids ascent and the appearance of partial melts as well as the distribution of these materials in the crust can be detected and imaged by their lowered seismic velocities, high Vp/Vs ratios, as well as increased attenuation of seismic shear waves. The seismic velocity anomalies detected so far are within a range of a few per cent to more than 30% reduction. Discussed will be results with findings from structural investigations at Lake Toba, Sumatra, Kamchatka and parts of the Andes.