cesses. The geochemical attributes of Hf isotopes in the zircon crystals may provide insights into the magmatic history and emplacement of poly-intrusive tonalitic and related rocks of the Adamello Batholith.

Zircon samples from six tonalitic plutons (one sample per pluton) from the Adamello Batholith were previously dated using secondary ion mass spectrometry (SIMS). The SIMS analyses produced U-Th-Pb zircon rim ages ranging from ~43 Ma to ~33 Ma for samples from southwest to northeast, respectively, across the batholith. Although results from the SIMS analysis agree with geochronological results, zircon grains in some of the samples contain inherited cores (ranging from ~200–2500 Ma which are some of the oldest geological objects thus reported in the Eastern Alps). Furthermore, the SIMS U-Th-Pb results indicated that several individual zircon crystals have varying ages for rims and cores. Three types of core-rim age variations were identified: (1) rims and cores of statistically similar age; (2) rims with slightly older cores; and (3) young rims with significantly older inherited cores. This study is subdivided into three parts, each answering a very specific question regarding age differences of the zircon grains:

1. Determine whether there is a systematic variation in εHf values for the rims of zircons from oldest to youngest plutons. Epsilon hafnium for these plutons may give insight into the origin, evolution, and/or magmatic relationship between the plutonic events.
2. For zircons that show age variations, investigate if there is compositional change of Hf isotopic composition in the rims and cores of these grains and if so, establish a unifying explanation for why this is so.
3. The third question to be addressed is why some zircons show core inheritance (i.e., young rim-very old core) and the nature of the inheritance whereas other zircon crystals from the same rock do not. Using Hf isotope data, it is believed that a concrete explanation will be established.

Chloride in kimberlites? Constraints from diamond oxidation experiments

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Kimberlites are the surface expression of deep-seated magmas derived from the subcontinental mantle. They intrude Precambrian cratons, forming pipe-shaped discordant structures, and erupt explosively at the surface forming pyroclastic deposits and craters. Kimberlites are often classified as ultramafic and alkaline rocks, but their primary composition is poorly constrained due to extensive contamination and secondary alteration. Volatile loss during eruption further compromises the record of volatile species. It is critical to improve constraints on kimberlite composition before we can understand its genesis and make inferences about processes in the mantle source.

A variety of methods are applied to ascertain the fluid composition of kimberlites, including fluid inclusion studies, infrared spectroscopy of olivine, and diamond surface features. Studies of fluid inclusions in a Canadian coated diamond showed high concentrations of Cl (26.6 ± 5.1 wt%). Additionally, high Cl content in a melt inclusion from olivine (18.5 wt%) and groundmass minerals (≥ 8 wt%) in the exceptionally fresh Udachnaya-East kimberlite (Siberia) imply high Cl^- content in kimberlitic melts and fluids. However, studies of diamond surfaces and olivine infrared spectra suggest H_2O-rich kimberlitic fluid compositions. Furthermore, Cl^--bearing minerals are not typically abundant in kimberlites, perhaps due to secondary Cl^- dissolution.

Natural diamond surfaces show a wide variety of different surface forms produced by fluid oxidation during magma ascent. Surface features are fluid composition-dependent, at least in the H_2O-CO_2 system. Hence, establishment of diamond surface forms produced by Cl^--bearing fluids will help further constrain kimberlitic fluid composition. To this end we explore diamond oxidation in the H_2O-Cl^- and CO_2-Cl^- systems at 1300 °C and 1 GPa in the piston-cylinder apparatus. Preliminary results show characteristic forms produced in NaCl-H_2O and KCl-H_2O compositions. Following completion of additional experiments, we will compare our results to diamonds from Lac de Gras kimberlites to constrain fluid composition in these kimberlites.

Character of the mafic trigger of the Kos Plateau Tuff eruption

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The Kos Plateau Tuff (KPT) eruption at 161 ka was the largest explosive Quaternary eruption in the eastern Mediterranean. There has been a discovery of an uplifted beach deposit of abraded pumice cobbles directly overlain by tuff that records the earliest phase of the KPT eruption. The pumice cobbles contain inclusions of basaltic andesite showing chilled lobate margins suggesting co-existence of two magmas. The basaltic andesite is more primitive than any other mafic rock known from the Kos-Nisyros volcanic centre and contains phenocrysts of Fo_{90} olivine, enstatite, and diopside. Groundmass amphibole suggests availability of water in the final stages of magma evolution. The abundant basaltic andesite was presumably the mafic trigger for the KPT eruption.