Dangerous anthropogenic interference with climate change

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We have already loaded the atmosphere with a sufficient amount of greenhouse gases to warm the global climate by about 2.4°C (90% confidence interval of 1.4 C to 4.3°C). Not all of this warming has been realized because; about 50% of this warming is likely masked by the dimming effect of aerosols. Current air pollution laws have been remarkably successful in reducing sulphate aerosols, a major contributor to the masking effect. Even with a targeted reduction in emission of 50% by 2030, we would be adding more than 75 gigatons of CO_2 to the atmosphere. Thus addition of new CO_2 in conjunction with the unmasking effect of the aerosol cooling effect is likely to push the system beyond the tipping points for several elements of the climate system, such as the arctic sea ice and the Himalayan-Tibetan glaciers, to name a few. We face a formidable challenge to avoid such dangerous climate changes and I will discuss options we have to meet this challenge.

Geochemical features of a protracted magmatism in the Fitz Roy plutonic complex, Chaltén, Argentina

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It has been discussed whether the intrusion of the Fitz Roy plutonic complex (FRPC), like other Miocene intrusion in Patagonia, is related to ridge subduction. Yet, our new Ar-Ar data (16-19 Ma) show that the igneous cycles of this complex pre-date the collision of the Chile ridge. Here we present geochemical data to further discuss the relationship between magmatism and structural setting.

We distinguish four different magmatic units. From older to younger they correspond to: (i) an ultramafic unit (mainly pyroxenites); (ii) a mafic unit (diorites and various gabbros); (iii) a tonalite unit, and (iv) a granitic unit (granodiorite and two types of granites). Adakitic and some highly evolved subvolcanic dikes cut the entire igneous suite.

Harker diagrams illustrate a typical evolution from mafic to differentiated compositions. However, granodiorites do not entirely follow this trend. They show lower contents of TiO_2, MnO, MgO, FeOtotal, P_2O_5 and higher contents of Al_2O_3, Eu, Zr, Nb and Hf. Ultramafic rocks have low ∑REE-concentrations and diplay flat patterns in chondrite normalized diagrams. Mafic rocks present a large variation of REE-patterns with both positive and negative Eu anomalies. Consistently higher REE-concentrations are observed in tonalite and granodiorite. Granites show a decrease of the LREE and an increase of the HREE with an almost flat profile in the more differentiated granite. An adakitic dike (La/Lu=248) resembles the nearby Chaltén adakite body dated at 14.5 Ma [1].

The FRPC shows a protracted magmatic history (19-16 Ma) and sub-volcanic dikes suggest that magmatism was still ongoing in the late stages of exhumation. We will argue that the intrusives may have different source regions at depth as well as evolutionary – e.g. deformation – histories. However, there is no direct link between magmatism and ridge collision. We will further speculate about the structural control of the magmatism at Fitz Roy - does it reflect local kinematic conditions or is it related to the regional-scale architecture ?

[1] Ramos *et al*. (2004) *Revista de la Asociación Geológica Argentina* **59**, 693-706.