Asian outflow to the Pacific observed during PEACE aircraft campaign in 2002

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Aircraft measurements of CO, NO, NO_2, NO_y, O_3, and various other species were made during Pacific Exploration of Asian Continental Emission phase A and B (PEACE-A and B) conducted over the western Pacific in January and April-May 2002. Variability in CO mixing ratio in the free troposphere during PEACE-B was greater than that observed during PEACE-A. Enhancements of CO up to 350 ppbv were observed at altitudes between 6 and 10 km at various locations over the southern part of Japan Sea on May 14. Back trajectories of sampled air masses suggest that some part of these air masses were uplifted over central China at latitudes around 30N one to two days prior to the encounter. High-altitude clouds were detected from the Geostationary Meteorological Satellite (GMS-5) in this region suggesting that convective transport of polluted air masses was responsible for these high CO values. Meteorological data analyses indicate that during PEACE-B warm moist air was frequently advected into this region at low altitudes from lower latitudes, causing cumulus convection when it encountered cold dry air advected from the north. The sub-tropical jet was also located around 30N in this region and air masses uplifted by convection were efficiently transported to the Pacific by the jet. These mechanisms are considered to play important roles for venting polluted air masses in the boundary layer to the free troposphere over East Asia and rapid horizontal transport of uplifted air masses to the Pacific during PEACE-B. Chemical characteristics of air masses influenced by these processes are also presented and discussed.

Porphyritic texture in linear cooling experiments: Implications for the origins of porphyritic grains in basaltic rocks

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Porphyritic textures are commonly seen in achondrites, lunar samples, martian meteorites and terrestrial rocks (e.g., lunar basalt 15596, eucritic material in EET87509 howardite, NWA1670 angrite). Some of such porphyritic texture are composed of large porphyritic grains set in a very fine-grained mesostasis. Porphyritic texture is often explained as follows: (1) two stage cooling [1], which is rapid cooling subsequnet to slow cooling, (2) porphyritic grains are xenocrysts. However, we have produced such a texture in our linear cooling experiments using analogous meteorite compositions, showing porphyritic grains are phenocrysts.

One example is from the 0.5 °C/hr cooling experiment (1175 - 900 °C) using the bulk composition of QUE94201 basaltic martian meteorite. The run product contains large euhedral pyroxene grains set in the fine-grained mesostasis mainly composed of lathy pyroxene and plagioclase (Fig. 1). The core composition of the porphyritic pyroxene is slightly more Ca- and Al-rich than that of pyroxene, which is in equilibrium with the melt, although Fe/Mg ratio is similar [2]. It is possible that the crystallization of plagioclase had been suppressed in the early stage, and then the mesostasis was formed from residual melts. Thus, this experiment suggests that porphyritic grains out of equilibrium with the parent melt could be formed as phenocrysts (rather than xenocrysts) by the simple single-stage cooling history. Hence, we need to be careful when we consider the origins of porphyritic grains in basaltic rocks.

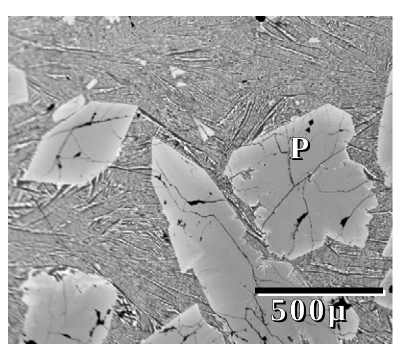

Fig. 1. BSE image of the QUE run product

References

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