

First investigations of IO, BrO, and NO₂ summer atmospheric levels at a coastal East Antarctic site using mode-locked cavity enhanced absorption spectroscopy

ROBERTO GRILLI¹, GUILLAUME MÉJEAN¹,
MICHEL LEGRAND², SUZANNE PREUNKERT²
AND DANIELE ROMANINI¹

¹Laboratoire Interdisciplinaire de Physique (LIPhy) UMR
5588, Grenoble, France.

²Laboratoire de Glaciologie et Géophysique de
l'Environnement (LGGE) UMR 5183, Grenoble, France.

The detection of highly chemical reactive halogenated species, such as BrO and IO represents a challenge for analytical techniques due to their short lifetime and very low abundance. The ability to take part to oxidative processes, such as the oxidation of dimethyl sulfide (DMS) and Mercury, increases the interest of the atmospheric community to better understand their role in the atmosphere and mainly in the Antarctica boundary layer where information from the polar ice cores, unique archive of climate proxies, can be retrieved. Detection of part per trillion (pptv, 1:10¹²) levels of BrO and IO radicals can be performed by probing rotationally structured electronic transitions in the near-UV employing mode-locked cavity-enhanced absorption spectroscopy (ML-CEAS). The technique is based on the injection of a broadband femtosecond laser into an optical resonator. The robust and transportable spectrometer provides shot-noise limited measurements for as long as 10 minutes, reaching detection limits of 0.04, 2, 10 and 200 ppt (2σ) for IO, BrO, NO₂ and H₂CO, respectively. The results of a field campaign at Dumont d'Urville Station in Antarctica during the austral summer 2011/12 highlight the differences in the oxidative capacity of the atmospheric boundary layer at coastal Antarctic sites, with the halogen chemistry being promoted to the West and the OH and NO_x chemistry on the East (Grilli *et al.*, GRL, 40, 1-6, 2013).

Inclusions in halite – evidence of mixing of evaporite xenoliths and kimberlites of Udachnaya-East pipe (Siberia)

S.N. GRISHINA

V.S. Sobolev Institute of Geology and Mineralogy, 630090
Novosibirsk, Russia
(correspondence: grishina@igm.nsc.ru)

Unknown compositional features of kimberlite magma, notably highly elevated alkalis and chlorine (up to 6 wt.%) have been declared in Udachnaya-East kimberlites [1]. These data are controversial and one question of debates is origin of chloride-carbonate segregations in unserpentinized kimberlite. It was supposed, that segregations represent pools of residual liquids and thus provide a new insights into composition of the kimberlite magma. Crustal assimilation is the alternative hypothesis and was considered theoretically [2]. We tried to use inclusion data as a new approach to clarify the origin of chloride-bearing segregations and the reasons for high chlorine content of kimberlites.

Part of chloride xenoliths in Udachnaya-East kimberlites are disaggregated and extensively altered to chloride-carbonate composition along the fractures and xenoliths boundaries. Transition from pervasive to no alteration xenoliths is correspondent to carbonate-rich and carbonate-free ones. Texture and inclusions of carbonate-free xenoliths are similar to pyrometamorphic evaporates [3]. Chloride-carbonate zones have distinctive textural features indicative of partial melting. The interaction between chlorides and kimberlites reveals by occurrence of natrocarbonatite-bearing inclusions along the fractures and boundaries both inside xenoliths and in kimberlite groundmass.

Chloride-carbonate segregations formed as a result of crystallisation of contaminated kimberlite magma in disaggregated chloride xenoliths. High chlorine content of studied kimberlites reflect syn-eruptive contamination.

[1] Kamenetsky (2012) *Lithos*, **152**, 173-186. [2] Kopylova (2013), *Earth-Science Reviews* **119** 1–16. [3] Grishina, (1992), *Eur. J. of Miner.* **4**. P. 1187-1202.