

## **Description of Additional Supplementary Information**

Supplementary Data 1: Summary table providing details of the modal mineralogy, PT estimates plus major, trace and volatile analyses of mineral phases together with calculated bulk-rock concentrations.

Supplementary Data 2: LA-ICP-MS analyses of standards

Supplementary Data 3: SIMS analyses

Supplementary Data 4: EPMA analyses of phlogopite

Supplementary Data 5: Statistical analysis of volatile contents of different mantle lithologies

Supplementary Data 6: Statistical analysis of bulk volatile concentrations in mantle lithologies.