# A view to the first half of the Earth's impact history: Barberton CT3 spherule layers, South Africa

S. ÖZDEMIR[1*], C. KOEBERL[12], T. SCHULZ[1], W. U. REIMOLD[3], T. MOHR-WESTHEIDE[3] AND A. HOFMANN[4]

[1]Dept. of Lithospheric Research, Univ. Vienna, Althanstrasse 14, 1090 Vienna, Austria (*seda.oezdemir@univie.ac.at)
[2]Natural History Museum, Burgring 7, 1010 Vienna, Austria
[3]Museum für Naturkunde Berlin-Leibniz Inst. for Evolution and Biodiversity Science, Invalidenstrasse 43, 10115 Berlin, Germany
[4]Dept. of Geology, University of Johannesburg, South Africa

No impact structures are known for more than the first half of the Earth's history. Currently the only known possible traces of impact are several Early Archean (ca. 3.20-3.47 Ga) spherule layers which are located in the Barberton Greenstone Belt (BGB), South Africa, and the Pilbara Craton, Western Australia. Based on geochemical and textural studies, these spherule layers have been interpreted as impact ejecta and may have formed as condensation products in the impact vapor plume and/or ballistically ejected liquid droplets.

Our study is focused on the CT3 drill from BGB, South Africa, where 17 spherule layer intercalations have been identified at various depths in the core. Detailed minerological analyses (optical microscopy, SEM and EPMA) show that undeformed and deformed spherules are mostly composed of secondary mineralization, such as quartz, K-feldspar, phyllosilicates, carbonates, oxides, and sulfides. They vary in shape, size and matrix/groundmass composition, resulting from physical and chemical alterations. Major and trace element determination, as well as Os isotope ratios, have been obtained by using XRF, INAA, N-TIMS, and ICPMS, with the goal to identify/quantify a possible meteoritic component. The results show high siderophile element contents, with up to 1.60 wt% Ni, 0.69 wt% Cr, 0.05 wt% Co, 2.06 ppm Ir, 0.02 ppm Au, and high Os concentrations of up to 4.3 ppm. These elements are considered to represent an extraterrestrial component, which is further supported by subchondritic to slightly superchondritic $^{187}Os/^{188}Os$ ratios (ranging from 0.11 to 0.19).

With the data thus obtained, we aim to identify alteration process, to study the depositional environment, to constrain any possible duplications of layers within the drill core, to classify the spherule layers and to correlate CT3 spherule layers with the other BGB spherule layers which have been determined by previous studies.