Petrographic and geochemical studies of impact breccia from the Eyreville drill core, Chesapeake Bay impact structure, USA.

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The Chesapeake Bay impact structure, 35.5 Ma old and 85 km in diameter, is one of the largest and best preserved impact structures on Earth. It was drilled in the central part in 2005-2006 by ICDP (International Continental Scientific Drilling Program) and USGS (United States Geological Survey) [1]. At Eyreville, the crater fill comprises sediment-clast breccia and sedimentary megablocks of the Exmore Beds, a granitic and an amphibolitic megablock, gravelly sand, suevitic impact breccia (a polymict, melt-bearing breccia), and granite/pegmatite and mica schist (Gohn et al. 2006). We performed petrographic and geochemical investigations of 43 samples of suevite, impact melt rock, polymict lithic impact breccia, cataclastic gneiss, and clasts in suevite, from the impact breccia section of the depth interval 1397-1551 m of the Eyreville B drill core. The impact breccia consists mainly of suevite. The suevite displays a grayish matrix with various mineral and lithic clasts (including metamorphic, igneous, and sedimentary lithologies) and melt particles. The amount of melt particles generally decreases with increasing depth. The suevite contains two intercalations of impact melt rock in the upper part and abundant large blocks of cataclastic gneiss in the lower part. Various shock metamorphic and related features have been observed in suevite, including abundant planar fractures (PFs) and planar deformation features (PDFs) in quartz, toasted appearance of quartz, ballen quartz, rare kink-banding in mica, and extremely rare PDFs in feldspar. Evidence of hydrothermal alteration, as the presence of smectite and secondary carbonate veins, was observed especially in the lower parts of the impact breccia section. Chemical composition does not vary much in the upper part of the impact breccia section (above ~1450 m), whereas in the lower part, larger differences occur, which is in agreement with decreasing homogeneity (in terms of increasing clast-size) with increasing depth. The impact breccias show a decrease in the content of SiO_2 combined with a slight increase of the abundances of TiO_2, Al_2O_3, and Fe_2O_3 with increasing depth, which might be caused by an increase of the gneiss/schist component with depth. Concentrations of siderophile elements (e.g., Co, Ni) are lower in the suevite than in the basement schists and do not suggest presence of a meteoritic component.

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Surface soil moisture on global, regional and local scale from satellite data

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Soil moisture is a key element in the global hydrologic, energy and carbon cycle. Knowledge about the location specific sensitivity of radar backscatter can be used for operational determination of relative surface soil moisture over large regions (Wagner et al. 2007). This approach has been developed for C-Band scatterometer (50-25 km, global, ERS1, ERS2 and ASCAT) and transferred to C-Band ScanSAR (1km regional, ENVISAT ASAR) and is operational on both scales. This method relies on a high number of acquisitions in order to get a realistic estimate of a dry and a wet reference value and thus sensitivity. The performance of L-Band SAR (12.5-100 m, ALOS PALSAR) is tested for applications on local scale.

The ASCAT (Advanced SCATterometer) instrument onboard MetOp (Meteorological operational) satellite series is a real-aperture radar operating at 5.255 GHz (C-band) with high radiometric resolution and stability. It has been launched in October 2006. The ASCAT succeeds the scatterometers flown on the ERS-1 and ERS-2 satellites. The spatial resolution improved from 50 km to 25 km. The ASCAT provides near global coverage within 24 hours, surface soil moisture product in near real time via EUMETCAST and mission continuity for a minimum of 14 years (a series of three MetOp satellites is planned by EUMETSAT). The long term availability of the ASCAT data together with the already existing ERS datasets provide a valuable tool for monitoring of extreme events. Anomalies can be identified globally which relate to hazards such as droughts and floods.

ENVISAT ScanSAR data in ASAR Global Mode are less frequently acquired but provide up to weekly samples on 1km resolution since December 2004. Current databases cover Sub-Saharan Africa and Australia. These data are also suitable to derive scaling parameters (Wagner et al. 2008) which allow downscaling of the coarser resolution data from scatterometer.

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Linking ore deposit mineral assemblages with metamorphism: a case study from the Pb-Zn ore deposit of St. Martin, Schneeberg (South-Tyrol, Italy)

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The deposit at Schneeberg has been one of the major Pb-Zn mining districts throughout the K.u.K dynasty. The Schneeberg is the highest deposit of Europe as well as the largest mining region in Tyrol whereas the peak of mining activities has been in the 15.-16 century, also known as the „argentic tyrolian age“, when thousands of miners work in the mines at St. Martin, Schneeberg (South-Tyrol, Italy). In the course of the special research project HiMAT (history of Mining in Tyrol and the adjacent areas), a thorough investigation, concerning the relation between metamorphism and selected ore deposits from the western part of the Eastern Alps is currently underway.