

## **Frequency-dependent magnetic susceptibility of limestones: a case study from the Late Silurian shallow-water limestones (Teplá-Barrandian Unit, Prague Synform, Czech Republic)**

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### **Abstract:**

A study of frequency-dependent magnetic susceptibility applied to limestones was a part of high-resolution petrophysical logging (low-field magnetic susceptibility measurements (MS), field gamma-ray spectrometry (GRS), rock magnetic measurements (anhysteretic and isothermal remanent magnetizations)) of Late Silurian (Ludlow Series, mid-Ludfordian Stage) Lau event interval in the Teplá-Barrandian Unit in the Prague Synform. A dynamic time warping (DTW) algorithm was applied to align MS logs of two studied sections (Požáry and Mušlovka sections). They show a perfect match and several prominent and minor gaps during sedimentation were detected. Mušlovka section represents a less complete succession compared to the Požáry section. At both sections, MS logs show elevated values across the Lau event interval. Magnetite was identified as the main carrier of the magnetic susceptibility signal at both sections with the exception in the lowermost and uppermost parts of the Mušlovka section where hematite and minerals with paramagnetic characteristics contribute to the MS signal. Frequency-dependent MS (FD-MS; %) measurements of limestones revealed a response of all samples (ranging from few per cents to 26 %; after correction for diamagnetic susceptibility) and suggested an occurrence of superparamagnetic particles below, across and above the Lau event interval. However, the samples with the highest FD-MS values (above 20 %) were relatively small and with weak signal and thus such high values could be erroneous. The Lau event interval in the Požáry section show generally increased FD-MS values (up to 18 %) when compared to the Mušlovka section (avg. 5 %). Formation of ultra-small magnetic particles had probably formed during diagenetic changes and due to alterations of the limestones during a regressive period at the Lau event interval, including even the subaerial exposure of rocks and pedogenetic processes.

**Keywords:** frequency-dependent magnetic susceptibility, limestones, Silurian, Ludlow, Prague Synform

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