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Cosmic iron, a new factor in podsolization in aeolian sandy deposits in NW-Europe (part 1, senior)

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In Netherlands is podzolization is the dominant soil forming process in medium fine sand deposits as Late-glacial coversand and Holocene driftsand. The natural soil evolution in such deposits tended to cambic podzols in xeromorphic and gleyic podzols in hydromorphic field conditions. Historical land use accelerated the soil acidification and transferred the majority of the cambic podzols in carbic podzols. The natural free iron content of coversand and driftsand deposits is very low (< 0,05 %). Before deposition the sand grains survived a long history of weathering, fluvial, glacial and finally aeolian transport. Consequently, the mineral composition is dominated by Quartz and the fraction of hydrolysable minerals is very low. However, the presence of iron is very clear in the spodic B horizons of cambic and carbic podzols. Sometimes carbic podzols and acid gleyic podzols show placic properties, due to the formation of iron crusts. If a soil profile is affected by iron rich groundwater, originating from fluvial, glacial or periglacial sediments which a higher free iron content, (the situation in brook valleys and some depressions) the concentrations of iron are probably sufficient to explain the presence of iron cutans in the Bs horizon and iron-rich gleyic mottles in the Cg horizon of a podzolic soil. However, if a soil profile is not affected by iron-rich groundwater (the situation in coversand ridges) the iron concentrations of the sand deposits are insufficient to explain the iron cutans in the Bs horizon. After abolition of the plaggic agriculture around 1900 AD, extensive parts of the Calluna heath have been reforested with Scotch pine. The mormoder humus forms, developed under these Pine plantations, are excellent soil records of the last century. Soil micromorphological analyses of thin sections of mormoder profiles indicate the presence of olivinic and other heavy mineral and opaque particles that have not received much attention in studies. Their presence does not conform to the expected properties of these sand deposits and must be derived from other sources. One potential and constant influx may be the deposition of iron-rich dust particles, or micrometeorites from space. Two types of micrometeorites can be distinguished; metallic and olivine. Due to the acidity of the F horizon of mormoders (pH 2,8 – 3,1) the metallic particles will dissolve quickly and the olivinic will accumulate in the soil profile. If we are able to detect traces for such a cosmic influx and understand spatial patters resulting from meteorological conditions (particles precipitating with rain during the last century or even during the Holocene) we can establish the role of cosmic iron in soil processes in areas where the deposition of micrometeorites is relevant.