Sea level changes interacting with vegetation: a palynological study on the Plio-Pleistocene Tjörnes beds (North Iceland)

GB 2012 Contestant for Best Oral Presentation

Verhoeven K.[1], Louwye S.[1], Eiríksson J.[2]

→ Koen.Verhoeven@ugent.be

1 Research Unit Palaeontology, Ghent University, Krijgslaan 281/S8, 9000 Ghent, Belgium

2 Earth Science Institute, University of Iceland, Askja, Sturlugata 7, IS-101 Reykjavik, Iceland

The Plio-Pleistocene sediments preserved in cliffs on the Tjörnes peninsula (North Iceland) give a unique insight in the changing biotic life during a major cooling period. The marginal marine deposits at Tjörnes hold terrestrial signals (pollen, spores, plant macro remains) as well as marine signals (ostracods, molluscs, foraminifers, dinoflagellates), although the signal is not always continuous. Organic-walled palynomorphs such as pollen/spores and dinoflagellate cysts however bypass pitfalls such as decalcification and saturation by silica. A simultaneous research on both proxies was possible throughout the entire Tjörnes beds and four interglacials of the overlying Pleistocene Breidavík Group.

Dinoflagellate cysts are an excellent biostratigraphical tool and allowed the construction of a robust age model for the section (Verhoeven *et al.* 2011). Eighty-eight samples and a total of more than 38,000 terrestrial palynomorphs were counted. Six Pollen Zones (PZ) could be defined (Verhoeven *et al.* submitted). Pollen types are seldom determined to species level, and it is consequently difficult to assess the exact position of the producing plant in the different habitats of the coastal area (vast marshes, levee forests, dry heathland, foothill forests, hill vegetation and higher situated basaltic plateaus). The preferred position of plants however became clearer through the combination of sedimentological data, mollusc data and pollen data.

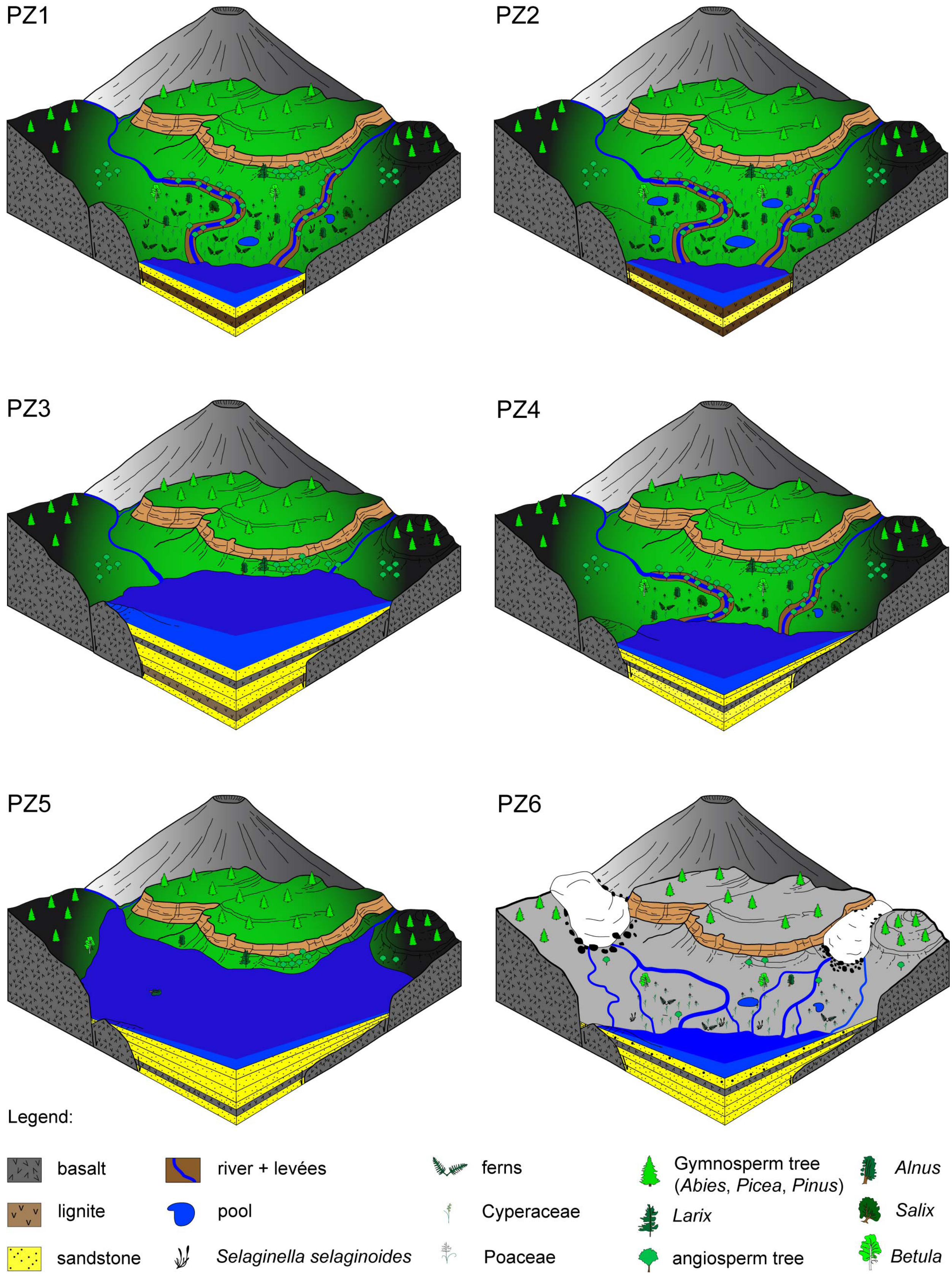
Molluscs with a specific water depth preference, in combination with a sedimentological analysis, allowed a relative sea level reconstruction (Buchardt and Símonarson 2003). The pollen zones are in agreement with this reconstruction and permitted moreover a refinement of the palaeoecological signal. In the first part of the Tjörnes beds (PZ1, 2), a vast marsh area existed that progressively increased in wetness. The pollen influx was local, and changed drastically in favour of the regional pollen derived from the plateaus during the upper part (PZ3), induced by a significant relative sea level rise. Gymnosperm trees dominate here the signal, and specific marshes and levees plants disappeared. During the deposition of the Early Pliocene Tjörnes beds, no temperature changes are visible in the pollen record.

The pollen indicate a clearly warmer climate then today during the deposition of the Tjörnes beds, Hörgi Formation and the Svarthamar Member. Within these deposits, warmth-demanding taxa as *Ilex*, *Quercus*, *Tilia*, *Sambucus*, *Viscum album*, *Castanea*, *Juglans* and *Acer* are recorded. An impoverished assemblage is observed in the Thorfhóll Member with *Pinus*, *Alnus* and *Betula* as the most important tree taxa, together with *Cyperaceae* and *Poaceae* as the dominant herbs, and spore plants.

Buchardt B., Símonarson L.A. (2003). *Isotope palaeotemperature from the Tjörnes beds in Iceland: evidence of Pliocene cooling*. Palaeogeography, Palaeoclimatology, Palaeoecology, Volume 189, Issues 1-2, pp 71-95.

Verhoeven K., Louwye S., Eiríksson J., De Schepper S. (2011). *A new age model for the Pliocene–Pleistocene Tjörnes section on Iceland: Its implication for the timing of North Atlantic–Pacific palaeoceanographic pathways*. Palaeogeography, Palaeoclimatology, Palaeoecology, Volume 309, Issues 1-2, pp 33-52.

Verhoeven K., Louwye S., Eiríksson J. (2012). *Plio-Pleistocene landscape and vegetation reconstruction of the coastal area of the Tjörnes peninsula, northern Iceland, based on a pollen analytical study.* Boreas, Volume 42, Issue 1, pp 108-122.



Evolution of the landscape in relation to the relative sea level variations. Reconstruction based on pollen data, sedimentological and malacological arguments (Buchardt & Símonarsson 2003).