



The Silurian a record of oceanic, atmospheric and biotic change

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The Silurian is the shortest time period of the Phanerozoic (~27.7 million years), but provides a rich record of oceanic, atmospheric and biotic change. Based upon an evaluation of key published sections from 18 countries, and fieldwork in the type-Silurian of the Welsh Borderlands and Carnic Alps, 10 global sequence stratigraphic cycles and their associated systems tracts and surfaces have been identified. Comparison with the sea level curves of Johnson (2006, 2010) and Loydell (1998) indicates a considerable amount of agreement with our cycles although in detail there are some notable differences.

In establishing our record of sea level change only sections that are biostratigraphically well constrained (by either graptolites or conodonts), show an unambiguous sedimentological expression of relative sea level change and are associated with tectonically stable regions have been used. Furthermore, attention has been given to sections exhibiting carbon and oxygen isotope excursions, extinction events, glaciogenic sediments and palaeo-water-depth indicators. An initial 50 reference sections, many containing multiple sequence stratigraphic cycles, have been captured in a bespoke database, allowing the synchronicity between oceanic, atmospheric and biotic change to be assessed.

Following the post-Hirnantian deglaciation of Gondwana the Rhuddanian Stage is broadly characterised by sea level rise. A minor sea level lowstand is identified in the mid-Rhuddanian, associated with an extinction event and an isotope excursion. During the Aeronian Stage Gondwanan ice-sheets were re-established resulting in several pronounced sea level cycles, many of which are associated with glaciogenic sediments, extinction and isotope excursions. Deglaciation and sea level rise are characteristic of the Telychian, with the highest sea level of the Silurian being achieved toward the end of that stage. Both the upper and lower Wenlock Series are associated with pronounced sea level falls, extinctions and isotope excursions, attributable to glacial episodes. The late Silurian (Ludlow and Pridoli) is characterised by a general lowering of sea level, resulting in the identification of relatively few reference sections. Nonetheless where sea level fluctuations can be determined they are in close association with extinctions and isotope excursions. Based upon these data a good global agreement between oceanic, atmospheric and biotic change can be demonstrated within the Silurian.

References

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