



## **The Carnian/Norian boundary interval and Carnian Pluvial Episode in northwestern Sichuan Basin, South China**

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The northwestern Sichuan Basin hosts a thick Upper Triassic succession, which is composed by basal oolitic-bioclastic limestones and middle sponge reef mounds, followed by terrigenous clays, siltstones and sandstones. This major facies change from carbonate to siliciclastic sedimentation has been related to the Carnian Pluvial Episode (CPE), an episode of carbonate crisis that is well recognized in northwestern Tethys margins and coincides with a major global negative shift in the carbon stable isotope record.

Four sections located in northwestern Sichuan Basin are studied for their biostratigraphy (ammonoids, conodonts and sporopollen) and stable carbon isotopes. The refined biostratigraphy from Qingyan Gou (QYG), Guanyin Ya (GYG) and Jushi (JS) sections implies that the carbonate crisis in NW Sichuan is late Carnian to early Norian. This is inferred from an upper Carnian ammonoid association with tropitids found at the boundary between carbonates and siliciclastics, overlain by *Guembelites philostrati* and *Thisbites cf. petralis* that suggest a lower Norian age for the basal siltstone and sandstone. Conodonts from the oolitic-bioclastic limestone and from the sponge reef belong to a typical late Carnian fauna (e.g., *Carnepigondolella*, *Epigondolella*), and sporomorphs from the siltstones and sandstones suggest an age close to the Carnian/Norian boundary. This amended age determination allowed to recalibrate the magnetostratigraphy of QYG section, which can be correlated tightly to a late Carnian to early Norian part of the Astrochronology Polarity Time Scale.

In the lower part of a fourth section (Maantang, MAT) lower Carnian ammonoids, conodonts and sporopollen were found. A strong negative carbon isotopic perturbation marks the occurrence of the Carnian Pluvial Episode (CPE), which is instead omitted in QYG, GYG and JS sections because the basal local karst surface either eroded most part of lower Carnian, or because the lower Carnian never deposited in that region. The change from carbonate to terrigenous sedimentation occurs earlier at Maantang than in the rest of the NW Sichuan Basin.

Overall, our findings pinpoint the position of the Carnian/Norian boundary in the NW Sichuan Basin to a short stratigraphic interval of less than 6 meters, which extends the geographical occurrence of the Carnian/Norian boundary and should reveal useful for a better informed placement of the Norian GSSP. Moreover, an early Carnian negative shift in stable carbon isotopes documents the presence of the CPE, and can be correlated to similar carbon isotopic oscillations on the opposite side of South China and western Tethys.