

# Long-term lacustrine paleo-productivity and/or paleo-anoxia trends controlled by eccentricity cycles in the continental Autun Basin (France) at the Carboniferous/Permian boundary

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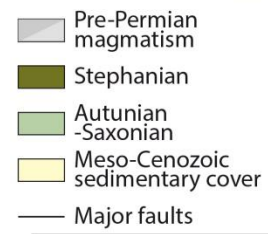
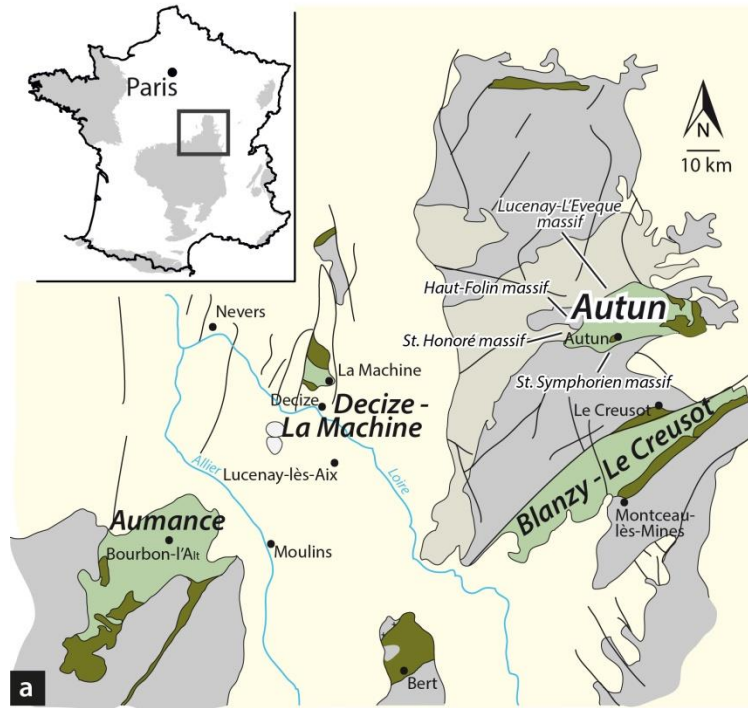
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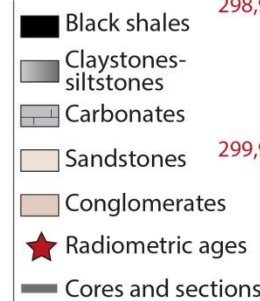
The organic-rich lacustrine beds of the Autun Basin (France) were deposited from the late Gzhelian (late Carboniferous) to the Sakmarian (early Permian), encompassing the Carboniferous-Permian boundary (~299 Ma). Those deposits reach up to 1500 m thick, and correspond to a tropical, intra-mountainous late-orogenic basin infilling associated with the Variscan orogeny.

# The Autun Basin

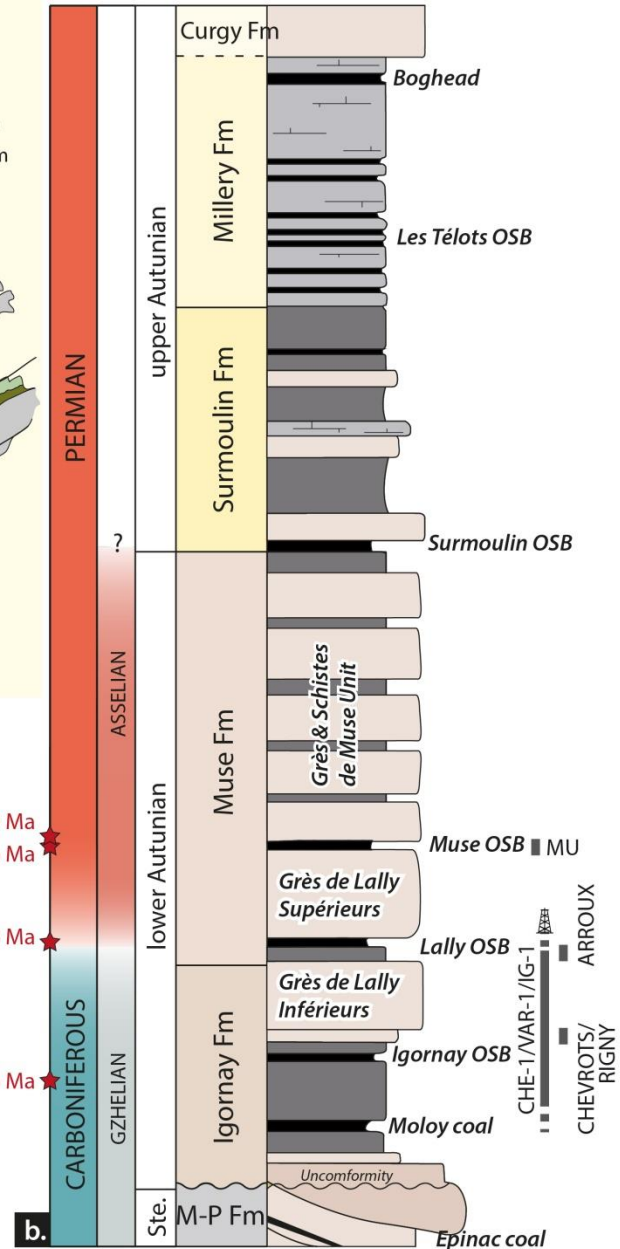
Organic-rich laminated facies are attributed to distal lacustrine environments which sometimes alternate with silty to sandy rich deltaic depositional environments (Mercuzot et al., subm.).



Radiometric data from Pellenard et al., 2017



Mercuzot et al., subm.

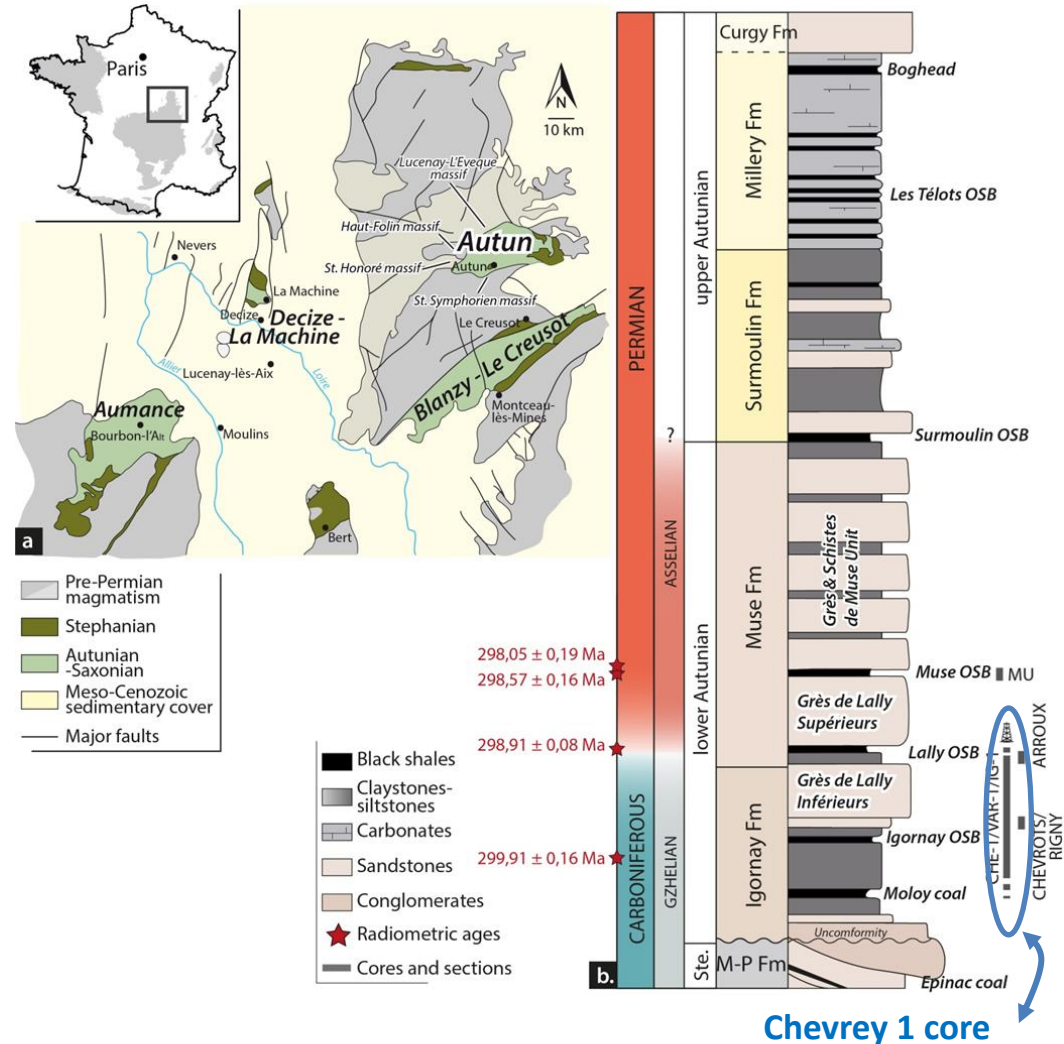


# Sedimentary infilling (1500m thick) in the Autun Basin

The four successive formations (respectively the Igornay, Muse, Surmoulin and Millery Fms) include series of **oil-shale beds** (successively the Mology, Igornay, Lally Muse, Surmoulin, Les Télots and Boghead Beds). These **oil-shale beds** are at least several m thick in the basin, except for boghead bed which is only 0.3 m thick.

We performed a detailed study of organic matter of the 364-m thick Chevrey 1 core, based on a Rock-Eval pyrolysis survey. The Chevrey 1 core encompasses the successive Igornay and Muse Fms., including the **Lally oil shale Bed** and the C/P boundary. This is the most detailed organic study in the Autun basin to date.

Mercuzot et al., subm.

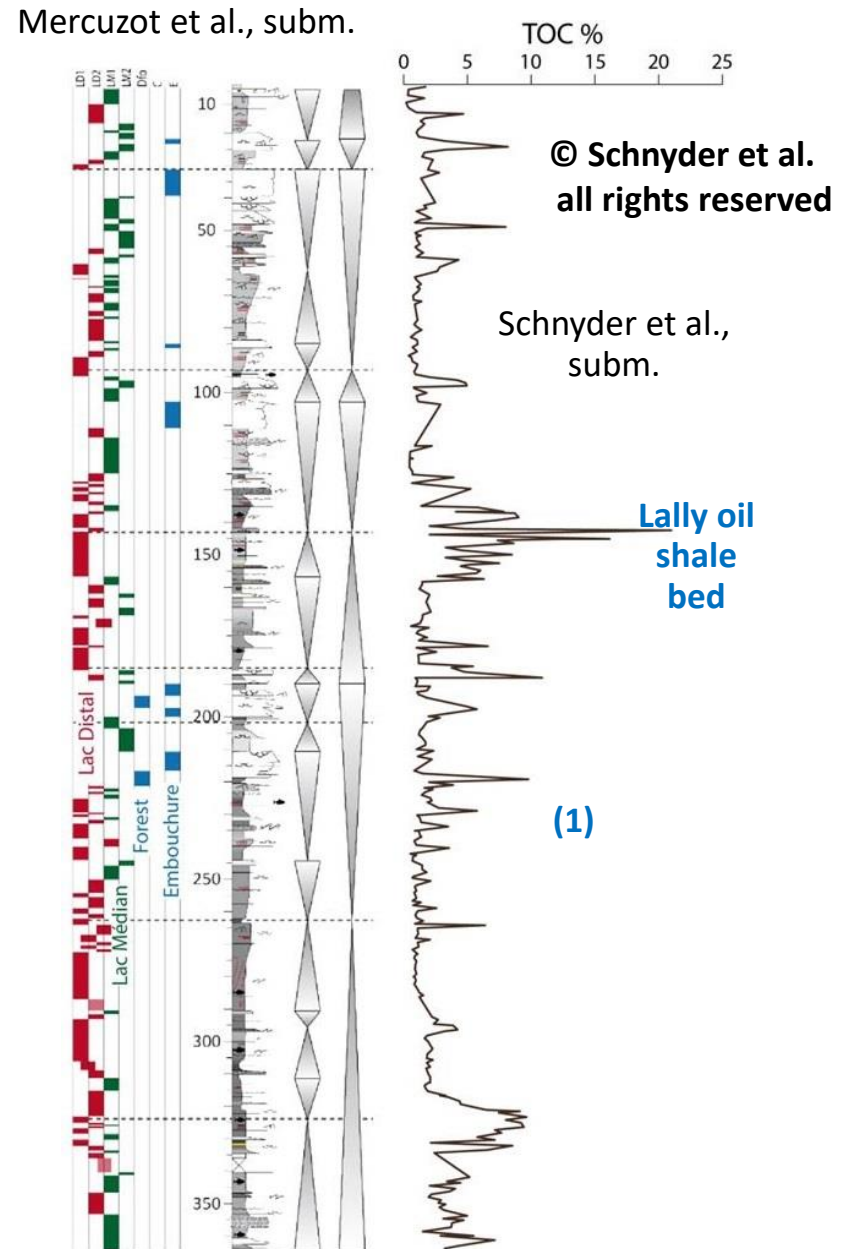


# Chevrey 1 core Rock-Eval results (only TOC figured)

TOC varies from 0.2 to 21 wt%, whereas HI values range from 22 to 421 mgHC/gTOC. The Lally oil-shale Bed corresponds to a 2.5-m thick interval of maximum organic preservation with TOC peaks reaching 12-21 wt%.

A long-term progressive increase of TOC accumulation, highlighted by several organic pulses is obvious, starting at -282.4 m and pre-dating the Lally oil shale Bed occurrence (1).

**We thus evidence for the first time that the Lally oil shale Bed corresponds to the short-lived apex of a long-term lacustrine organic rich sequence of increasing paleo-productivity and/or paleo-anoxia that is ~ 200 m in thickness.**



# Cyclostratigraphic test

Schnyder et al.,  
 subm.

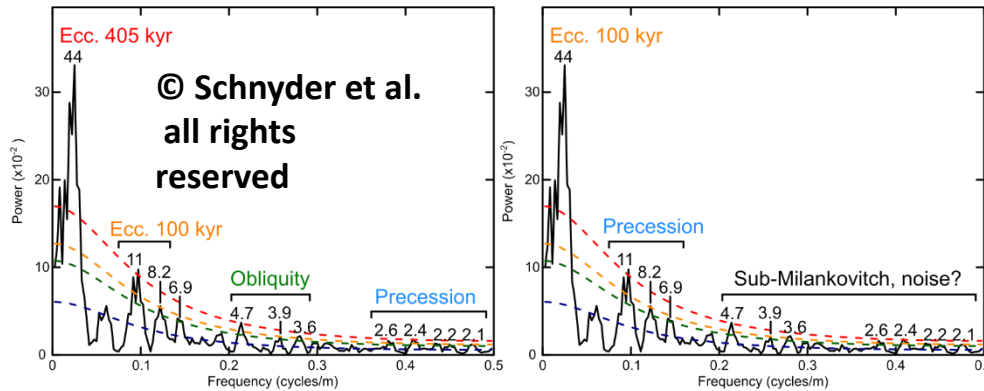
A cyclostratigraphy study using the Chevrey 1 TOC record from the Rock-Eval shows that the organic matter accumulation at Chevrey 1 is controlled by astronomical cycles.

Statistical comparisons between sedimentary and astronomical cycles favour Option 2 (e.g. a mean sedimentation of 400 m/Myr)

Recently acquired U-Pb ages (Pellenard et al., 2017) and basin-wide correlations (Mercuzot et al., subm.) also favour this option

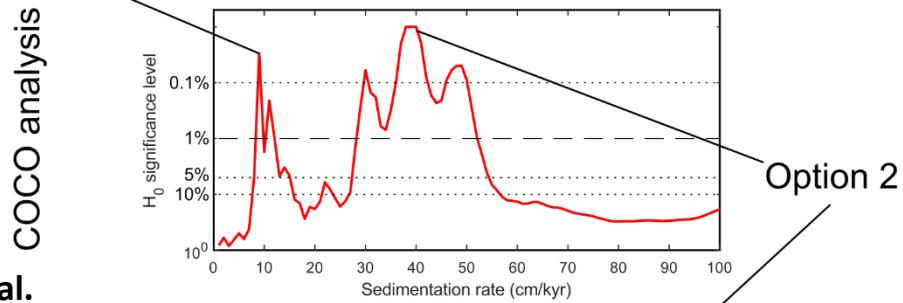
Option 1

Option 2



Option 1

Option 2



TimeOpt analysis

