Rock analyses were performed on a Rock-Eval 6 device (IFPEN, France), according to the Basic/Bulk Rock method described in Behar, et al. (2001). The Rock-Eval measurements provide Total Organic Carbon (TOC %wt) and Mineral Carbon (MinC %wt) contents. Carbonate contents (CaCO3 %wt) are calculated from MinC. Typology and maturity of the organic matter are determined from hydrogen and oxygen indexes, (respectively, HI and OI) and Tmax values.

Results and Discussion
All OM samples display low thermal maturity indices (Tmax < 430°C), well below the oil window, therefore excluding a significant alteration due to burial or thermal diagenesis. In these conditions, pristine TOC and CaCO3 contents were preserved. Hence, coupled organic carbon-carbonates changes reflect changing flux of carbonates, siliciclastic and organic matter components as proposed by Ricken (1993).

A general overview of TOC and CaCO3 contents for both sections (Fig. 2) gives evidence that sedimentation is mainly controlled by variations of carbonate deposition during Rhaetian and very Early Hettangian. Then, three successive events of increasing rate of OM deposition occur during Hettangian. These events are related to dysaerobic to anaerobic conditions prevailing at the time of the Blue Lias Formation deposition. During these events, deposition of a high quality OM with HI higher than 700 mgHC/gTOC is paramount, and led to the formation of a source rock with an exceptional potential.

Comparison of beds 1 to 6 at Doniford bay and Saint Audrie’s bay suggests that despite lateral variation of facies, the same factors control the dysaerobic event, recorded for both sections, and the OM supply, which is constant and more or less diluted by the carbonate input. It suggests that a global trigger precludes at this dysaerobic event.
Conclusions
The three-component sedimentation model of Ricken applied to this basin enables to discriminate the different sedimentation styles linked to the deposition of an exceptional source rock. This very simple approach delivers information on redox conditions and sedimentation controls, which can be readily obtained after Rock-Eval data. Further application of the method will be developed during the meeting.

Figure 2. TOC (%wt) vs CaCO₃ (%wt) at Saint Audrie’s bay (SA, lower diagram) and Doniford bay (DN, upper diagram). Aerobic, dysaerobic and anaerobic domains are displayed for sedimentation rates higher than 4m/ Ma. The diagrams illustrate two different sedimentation styles associated to different redox conditions.

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References
