

## The use of Virtual Outcrop Models, digital geology and legacy data to reappraise Devonian basin evolution in NE Scotland and Shetland.

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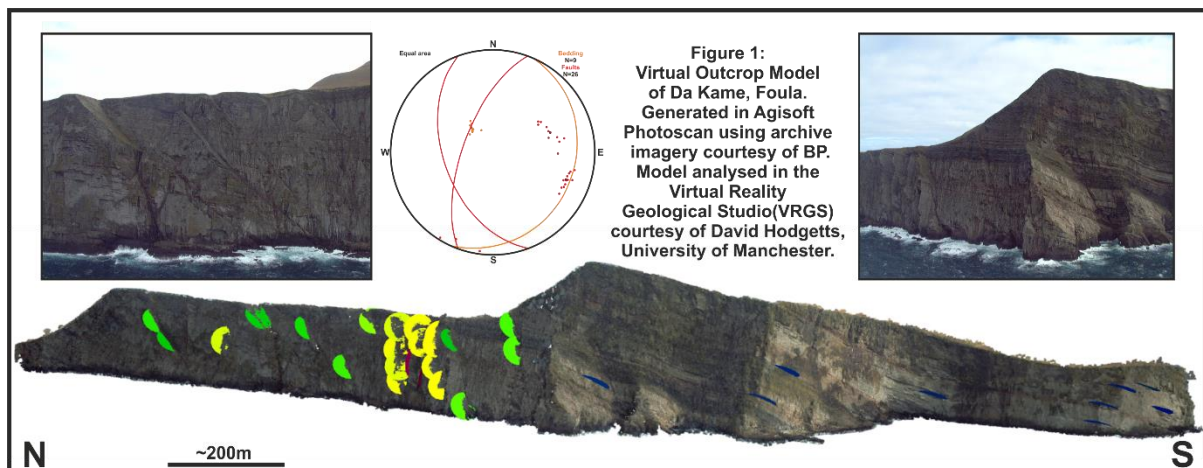
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### Abstract:

The extraction of 3D geological information from virtual outcrop models created using drone-based photogrammetry allows for the collection of useful and valuable geological data, quickly and relatively easily, from areas previously inaccessible, overlooked and considered to be 'missing' or 'lost' (See Fig.1). Outcrops can be now re-visited at any time and further geological analysis carried out, producing ever increasing quantities data which can be now be easily shared and viewed in 3D. These new digital geological methodologies are not a replacement for traditional fieldwork, but should be seen as the 'norm' and used to supplement and complement traditional fieldwork, desk-based studies and geological data analysis.



Use of these models, in conjunction with the re-interpretation and re-examination of large quantities of onshore and offshore legacy data generated by industry and academia is a more cost effective and time efficient approach, avoiding the duplication of datasets. Vast quantities of data can now be collated, interrogated and analysed in new ways highlighting trends and features hidden away within solitary datasets and in archives.

We illustrate this using a reappraisal of the stratigraphy, structure and tectonic evolution of onshore analogues for the Devonian-Carboniferous Clair Basin that includes detailed analysis of basement/cover contacts, and the structure of the overlying Devonian sequences. This is

achieved through mixture of desk-based study, reappraisal and analysis of legacy and new onshore and offshore datasets, fieldwork, structural analysis and the production of Virtual Outcrop Models.

Our new synthesis extends from Shetland, Orkney and Caithness and consistently reveals synchronous faulting and synformal growth folding in all areas. These observations are consistent with models of constrictional extension during regional sinistral transtentional Devonian basin development. This unusual basin architecture together with the diversity of basement/cover relationships apparent in the Orcadian Basin could lead to difficulties in exploration and appraisal of resources offshore. Thus established models for Devonian basin development used offshore may require revision.