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Combined Remote Sensing and Field Investigations of Hydrocarbon Trap Analogue Structures: Examples from the Zagros Simply Folded Belt, Iran and the Sawtooth Range, Montana [ABSTRACT]

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Session 3: E & P Related Research ***Session Chairs: Jerry Chessell & Steve Veal***	
14:00	**KEYNOTE: Eirik Larsen (Statoil Hydro)** Industry-academia collaboration invigorates exploration in the South Viking Graben.
14:30	**Aggeliki Georgiopoulou (University of Cardiff)** Determining lateral and vertical seal integrity in channel-levee complexes .
15:00	**Lucky Imagbe (University of Jos)** Modelling void geometry in deepwater reservoirs 'x' field, offshore Niger Delta, Nigeria.
15:20	**Alex Finlay (University of Durham)** Re-Os Geochronology of oil source rocks: a viable tool for petroleum exploration?
15:40	**Julio Almeida (Universidade do Estado do Rio de Janeiro)** What is the role of crystalline basement geological mapping in the oil industry?
16:00	**Gordon Beattie (No Affiliation)** Hydrocarbon exploration in the archives.
16:20	**Tea / Coffee**
Session 4: Structural Geology II – Compressional Settings ***Session Chairs: Dorthe Hansen & Andrew McAndrew***	
16:50	**Caroline Burberry (Imperial College, London)** Combined remote sensing and field investigations of hydrocarbon trap analogue structures: Examples from the Zagros Simply Folded Belt, Iran and the Sawtooth Range, Montana.
17:10	**Ian Watkinson (Royal Holloway, London)** Strike-slip faulting in Peninsular Thailand: basin evolution and linkage to regional tectonics.
17:30	**Steven Sawyer (University of Edinburgh)** Influence of tectonic inversion and salt mobility on structural styles and reservoir quality in the Norwegian Central Trough.
17:50	**Seb Turner (Imperial College, London)** The role of pre-existing structures in the evolution of the Kepingtage fold-thrust belt, Tarim Basin, China.
18.10	**KEYNOTE: Tim Pharaoh (British Geological Survey)** The Atlas of the Southern Permian Basin Area (SPBA Project): Progress report and insights on the Permian to Cenozoic tectonic evolution of West Central Europe.
18:40	**Reception**

Combined remote sensing and field investigations of hydrocarbon trap analogue structures: Examples from the Zagros Simply Folded Belt, Iran and the Sawtooth Range, Montana

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Structures that outcrop at the surface in fold-thrust belts are frequently good analogues for hydrocarbon traps in compressional environments. Along-strike changes in structure and geometry have important implications for connectivity and fluid flow throughout the petroleum system, e.g. in the Zagros Simply Folded Belt, Iran, and in a surface reservoir analogue in the Sawtooth Range, Montana.

Using satellite images and remote mapping, the Zagros Simply Folded Belt is ideal for the study of along-strike change in structure at a convergent margin. Lines of anomalously long, high-aspect ratio folds, crossed by multiple wind gaps, are clearly linked to movement along basement thrusts and correlate with major steps in the landscape. The basement faults formed sequentially as the deformation front progressed SW towards the Persian Gulf. In the Zagros, brittle and ductile deformation processes interact. Movement along a ramping-up thrust creates a fault-bend fold. Compressive stresses build up, leading to serial folding in the cover behind the fault-bend fold. Eventually, deformation of the block requires stresses in excess of those required to form a new thrust. The original thrust is abandoned, the footwall collapses and the process repeats.

A field study of a fold pair in the frontal region of the Sawtooth Range, Montana indicates that individual folds may change considerably in geometry and deformation style along strike. The N-S trending Teton anticline and Little Teton Anticline are both incipient box folds with broad rounded hinges formed in the carbonates of the Mississippian Madison Group. The fold wavelength is determined by the depth of the detachment, which ramps up from the Cambrian shales in the hinterland, to Devonian shales and finally Cretaceous shales in the foreland. The Teton Anticline is a near symmetrical fold in the northern mapped section but becomes distinctly asymmetric when traced to the south.

The change in geometry of the Teton Anticline implies that there is increasing complexity in the sub-surface thrust faults to the south. This complexity may be related to the influence of pre-existing basement topography. Folds in a fold-thrust belt display a spectrum of different geometries between detachment folds and fault-related folds. These differences are determined by the relative amounts of brittle and ductile deformation and occur both along and across the strike of the fold-thrust belt, and along strike of individual folds.