



The Geological record of environmental change

Utah: Sediment transportation within incised valleys

Voice Over

But what happens to the sediment that is transported through the valleys during times of sea level fall and low water?

Steve Flint

I'm sitting on a 3 metre thick sandstone in the eastern Book Cliffs. Below this sandstone is tens of metres of marine shale. When I look at the internal features of the unit I see current ripples, sun wave ripples, and significant cross-bedding. In more detail this sandstone is coarse-grained, in fact it's coarser grained than anything we've seen so far. It contains bi-valve fragments and, locally, as I can see here, shark's teeth. Now locally this unit forms the tops of the hills so I can't tell what originally overlaid it. However, when I map around to the north-west I notice that there is at least 50 metres of marine shale directly above it, so this unit was encased in marine shale, both below and above. That raises a question then: how did it get here, how was it emplaced? In order to answer that question I'm going to meet up with John 2 kilometres to the west of here.

Hi John. I've been tracing these units over 2 or 3 kilometres into this area and I've been seeing sharp-based units, evidence for rapid deposition, fairly shallow water conditions and then capped by a marine shale. Well what are you seeing here?

John Howell

This lower unit here contains a series of muddy heteroliths. The inter-bedded sandstones and mudstones include a whole series of wave and current ripples, and the mudstones include a whole series of marine bioturbation, indicating these are, in fact, marine rocks. Above this surface here we have a one metre thick sandstone which includes a whole series of soft sediment deformation and load structures at the base of it. That implies it was emplaced pretty quickly.

Steve Flint

So we've got a problem here. How do we emplace these volumes of sand out into the deep basin? I wonder if sequence stratigraphy can shed light on that. What I've been thinking is we've seen a lot of incise valleys at different stratigraphic levels. Now we know that incise valleys are conduits for sediment to bypass the shoreline during low stand and deposit sediment at their mouths. I wonder if these are those sort of sediments deposited at the mouths of incise valleys during low stands.

John Howell

Well we've studied the facies in some detail and we've certainly seen a lot of evidence for sea level rise, and also sea level fall, so that sounds like a reasonable model to me.

Steve Flint

I think we need to do more work to understand the detail of these low stand units so you know although the Book Cliffs has been a proving ground for sequence stratigraphy for some years, it's not over yet.

John Howell

No, but there's a storm coming.

Steve Flint

I know.