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A Half-Billion Year Old Storm Layer in Utah

I'm not a paleoclimatologist, but I am a geologist. And Earth's rocks and fossils can tell us a lot about ancient climates. Some of what we can learn is pretty wild.

For instance. Back in the 1970s I was a PhD student in geology at the University of Kansas, studying Cambrian trilobites in the mountain ranges of western Utah. I spent a few weeks one summer in the Drum Mountains, which, like most of the ranges there, are uninhabited, because they contain no potable water.

I was studying fossils in the Whirlwind Formation, which consists of two shaly intervals separated by a hard limestone unit 10 or 15 ft (3-4.5 m) thick. At the top of the limestone in the Drum Mts is a storm deposit (tempestite). The middle-Whirlwind limestone is found over much of west-central Utah, but the storm deposit at its top is limited to the Drums, as far as I know. It is a remarkable feeling to stand on a layer about 6 inches (15 cm) thick that was laid down by a single event over a period of hours, more than 500 million years ago. Geology is a science characterized by wild variations in precision like this. We don't know what day/year/etc this storm took place, but we know that it didn't last more than a day or so.

Western Utah is a desert, and there isn't enough vegetation to hide the rocks. The mountain ranges consist of large slabs tilted by mountain-building long ago. Low areas are covered with sediment, and 10,000 years ago they contained streams that ran into ancient Lake Bonneville (the Great Salt Lake is all that remains). The up-tilted faces of the blocks are exposed for many miles. You can step up onto that storm deposit in one locality and follow it for miles before you lose track of it, usually at a major fault. I didn't make any effort to map it out when I was there, because I was focusing on the trilobites. But wherever I saw the storm deposit, it looked the same: about the same thickness and internal structure. The layer was a sheet of gravel, consisting of flattish pieces of limestone that had been torn up from the sea floor by a monster storm. As the storm's power waned, the pebbles dropped where they were. They covered many square miles, a carpet of rock chips up to a couple of inches (5 cm) across consisting of thinly laminated limestone. This is one of the things that is so cool about geology. We are seeing evidence of weather more than half a billion years old. And this is just the most prominent storm deposit in the Whirlwind. The trilobites I was collecting make up scores of thinner storm deposits (an inch or less in thickness; <=2.5 cm) in the upper and lower parts of the formation. These layers can't be traced as far as the thicker one, but they tell us that this ancient shallow sea floor, home to abundant trilobites, was repeatedly swept by powerful storms. Over a period of millions of years, trillions of trilobite shells were tumbled about, broken apart, and laid down, much like the windrows of shells and seaweed you can see on a modern beach after a storm. By studying deposits like these, paleoclimatologists try to understand ancient climates. From their insights we can improve predictions about future climatic changes.

Reference:

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