



Island Arc Magmatism: Santorini

Santorini's Volcanic History

Dr Steve Blake:

All over Santorini are these cellars which the locals have cut into the rock because the rock is soft. However, it's the succession in the rocks that tell us about the volcanic history of Santorini. This is the upper of the two beds. You can see it's made of a rock that's rather soft and friable. In fact, it's pumice. If you look at the grain size of the pumice, it covers a rather narrow range. Maybe the largest piece of pumice I can see is maybe eight centimetres across, and the range in sizes is rather small too, so it's a well-sorted deposit, an airfall deposit. The bottom of the layer is down here and there's an interesting layer that must be about fifteen centimetres thick. It's made of this smaller grain-sized material and it tells us about the very beginning of the eruption. When the vent was just opening, the rocks around the vent would have been smashed up in the explosion, and these tiny fragments transported and deposited here, then as the eruption grew stronger and stronger, bigger and bigger, fragments were erupted and built up this layer of pumice and lithic fragments that we see here. At this spot, the layer must be about four metres thick and, in fact, all round here, all along the cliffs this layer is exposed so it's a very widespread layer as well, and must represent a lot of magma, maybe a few cubic kilometres of magma even. So this deposit records a very violent and large eruption. Other kinds of pyroclastic eruptions on Santorini leave their own kinds of deposits and there's a different deposit just a little way up the road. This is a layer I want to show you. It's fine-grained and quite thick. An interesting piece I collected from an outcrop further up there is this slab here. Notice these round, spherical objects sticking out of this weathered piece of rock. They are accretionary lapilli and formed in a wet, volcanic environment where magma and water interact explosively and generate lots of fine dust. Because it's a wet environment, the fine dusts stick together on little clumps of rock and rock fragments to build up these concentric lapilli, so this kind of rock tells us that magma and water were interacting at the time of its formation. In other words, this rock was probably formed during a phreatomagmatic eruption. In the Faros section we saw at the very bottom submarine eruption products, then in the subaerial sequence we had scoria, pumice beds and now this phreatomagmatic bed, quite a record of explosive volcanism in this island arc setting.