

Fall, 2003

Scott,

Generally I agree with your manuscript and your answers to questions. As you may notice weathering is a quite virgin field, especially concerning field studies. We know quite little about the timing of weathering of surfaces and weathering rates in nature, but quite a lot of weathering in the lab. Below I will just consider a few questions a little.

1/ The dressing of one of the sides as well as tools and technique to make the runcs are an important issue. We will probably discuss this matter with a stone mason who know a lot of traditional techniques etc. The concoidal fractures also puzzles me a bit.

2/ The "tree-root-traces" is certainly something for a specialist on trees.

3/ Pyrite weathering: We have been occupied with this mineral quite a lot. The major question however was if the sulfur in sulfate minerals in some building stone containing pyrite, in particular Gotland sandstone, has been added from the stone itself (the pyrite) or from the atmosphere. Thus, we have analysed isotopes of sulfur in gypsum and jarosites (iron-sulfate-minerals). The results indicates that stones in urban areas are polluted with foreign sulfur, while that in rural areas mainly originates from the bedrock itself (oxidation of pyrite).

Your problem is another – can the oxidation of pyrite be monitored to arrive at weathering/dissolution rates of pyrite? Weathering of rock surfaces have interested us the last decade. We have used different methods to study these, but none is very dependable or exact. Guess the only way is to expose fresh surfaces to different surroundings, and follow the oxidation of pyrite – or to find surfaces, which have been exposed for known periods. The latter would be best of course, but how to find such surfaces? Your tombstone examinations might be a possible way, especially if you compare what happens above, at and below ground.

4/ Concerning your offer to study thin sections of the core. I must discuss this with Dr. Morth. In principle we can only study KRS in spare time. I think it is better to look at the stone before deciding to do any further examinations.

Runo

Some questions on the KRS manuscript

Term "cleavage" between photos 2 and 3: Do these represent the schistosity of the stone, or anything else?

Paragraph starting after photo no. 5: "The calcite was deposited in the crack and exhibits a preferred orientation of elongate chlorite". Were both calcite and chlorite deposited contemporaneously?

The triangular area with calcite (photo 6): How do you know that the calcite is hydrothermal? Crystal size/form or what?

Paragraph after photo 11: Retooling of the runes or not? One of the major points. Exactly how to differentiate retooled and original runes? Colour and microtopography?

Photo 13 (the split side): Is the whole side or only the central part retooled? From the photo you get the impression that the central part might be fresher/lighter in colour, while the left- and right-hand side (with the Holand "H") is darker! You say that the entire split side was dressed in the following page!

Photo 14 (the concoidal fracture): Why concoidal? What tool gives such a scar?

Photo 18 (calcite): You regard the calcite as deposited from groundwater! Why- crystal size and form or what?

Retooling/not retooling (photo 13 and 19): This is certainly one of the major points. It is imperative to study this rune by rune. I suppose, that there are also runes retooled only in part. Studies of this type would allow to check the difference in weathering (this is just a guess, as I have not seen the stone). Have all the word-separating signs also been retooled? What tool was used to make these?

Iron oxide staining: My experience tells me that you can also find iron staining where biotite is weathering chemically – with oxidation of Fe^{2+} in the biotite!

Root-leaching: I do not know enough of tree roots and how they take up nutrients. One important thing is that only certain trees possess ectomycorrhiza, Do you know the species of the tree growing with its roots touching the stone?

Weathering, core sample: Is there no difference between the weathering of plagioclase and orthoclase? What is the composition of the plagioclase? Plagioclase, especially anorthitic ones usually weather chemically distinctly faster than orthoclase!

Tombstones: Important to compare tombstone weathering above, at and below the soil surface. On the fresh tombstone surface you find gypsum according to your diagram (air pollution or pyrite giving S, Ca from calcite/plagioclase/added from outside?).