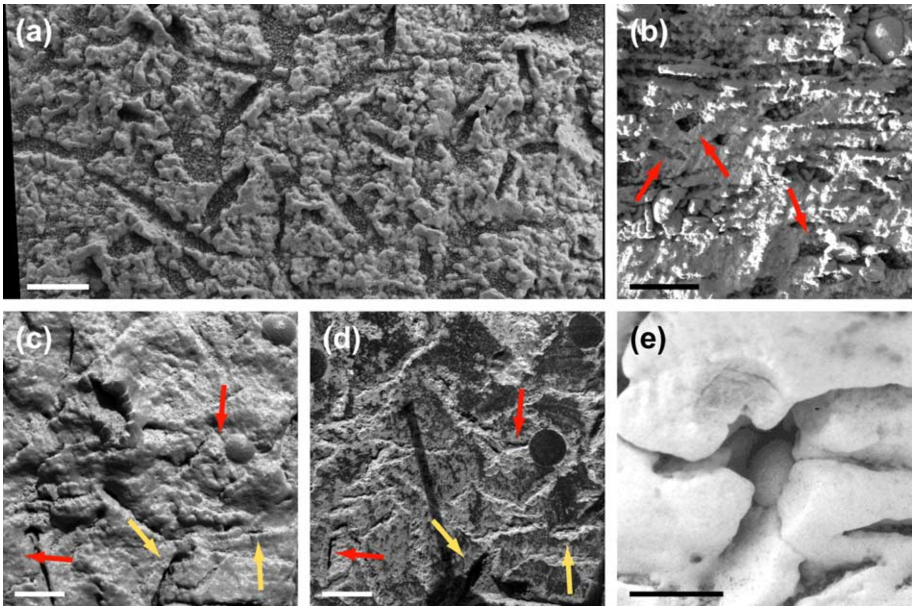

Fig. 11. MI images of crystal-shaped molds. Scale bars are 5 mm. (a) Close up of MI mosaic taken on Sol 27 (El Capitan) showing distribution of molds in the upper interdune facies. Note that the pores are elongate, commonly with sharply defined margins and angular teminations, are randomly oriented and are significantly larger than sand-sized grains. The pores are interpreted to represent secondary crystal moldic porosity. The site of the molds is interpreted to have been the original location of a highly soluble, near-euhedral evaporitic mineral that formed within the sediment during or shortly after deposition. (b) Close up of MI mosaic taken on Sol 151 (Kettlestone) showing distribution of crystal molds. Note that these molds have similar shapes as seen in (a) but that many are smaller and have lower length/width ratios (red arrows). (c), (d) Close up of MI images taken of the rock Guadalupe on Sols 34 (c) and 35 (d) showing the same field of view of pre-RAT and post-RAT surfaces. Note that in some cases molds that are present on the unabraded surface become enlarged on the abraded surface (yellow arrows) and in other cases, molds that are not observed on the unabraded surface appear on the abraded surface (red arrows). These observations are considered evidence that the molds represent intrinsic porosity in the rocks rather than a surface erosion feature. (e) Close up and highly stretched MI image taken on Sol 29 (El Capitan) showing a spherule impinging into a crystal mold. If the moldic porosity had been present when the spherule formed, it is likely that the shape of the growing spherule would have been influenced by the increased permeability. Accordingly, this cross cutting relationship is taken as evidence that the secondary porosity represented by the molds post-dates the formation of the spherules.

been abraded by the RAT (compare Fig. 11c and d). Physical abrasion is most likely to diminish its effect with depth rather than increase its effect. At the extreme, some crystal molds that are exposed after abrasion are not present on the unabraded outcrop surface (compare Fig. 11c and d). Finally, no partial or complete intact crystals of similar habit were encountered on any pristine surface or on any abraded surface.

Magnesium sulfate is one likely major evaporitic component of the outcrops and such minerals are highly soluble [25]. During diagenesis, the mold-forming crystal material consistently and fully dissolved but the surrounding evaporitic minerals appear to have remained largely intact, thus constraining the candidate crystal compositions to be a late-forming evaporitic mineral. Melanterite, a low density, hydrated ferrous sulfate is one possibility to account for the features observed. Its monoclinic crystal habits include stubby prismatic or blocky to tabular crystals. Melanterite has also been observed in acidic terrestrial environments [30,54]. Other possibilities include magnesium or iron chlorides and, less likely, glauberite, a Na–Ca sulfate.

The relative timing of the crystal molds and hematitic concretions is only partly constrained. In places crystal molds abruptly terminate against the edge of spherules (Fig. 11d) suggesting but certainly not confirming a cross cutting relationship consistent with the interpretation that the mold-forming mineral was early. The formation of the secondary moldic porosity appears to post-date formation of the hematitic concretions: in Fig. 11e, a spherule is shown impinging an empty pore, but neither filling the space nor having its spherical shape perturbed. Had no crystal been present at this point in the diagenetic history, the spherule's symmetry should have altered as it preferentially grew into the vacant space.

On many abraded surfaces large elongate to sheet-like irregular void spaces occur. These features appear to have a preferential but by no means exclusive alignment with primary bedding fabrics (Fig. 12). The scale of these features is typically millimeters to centimeters