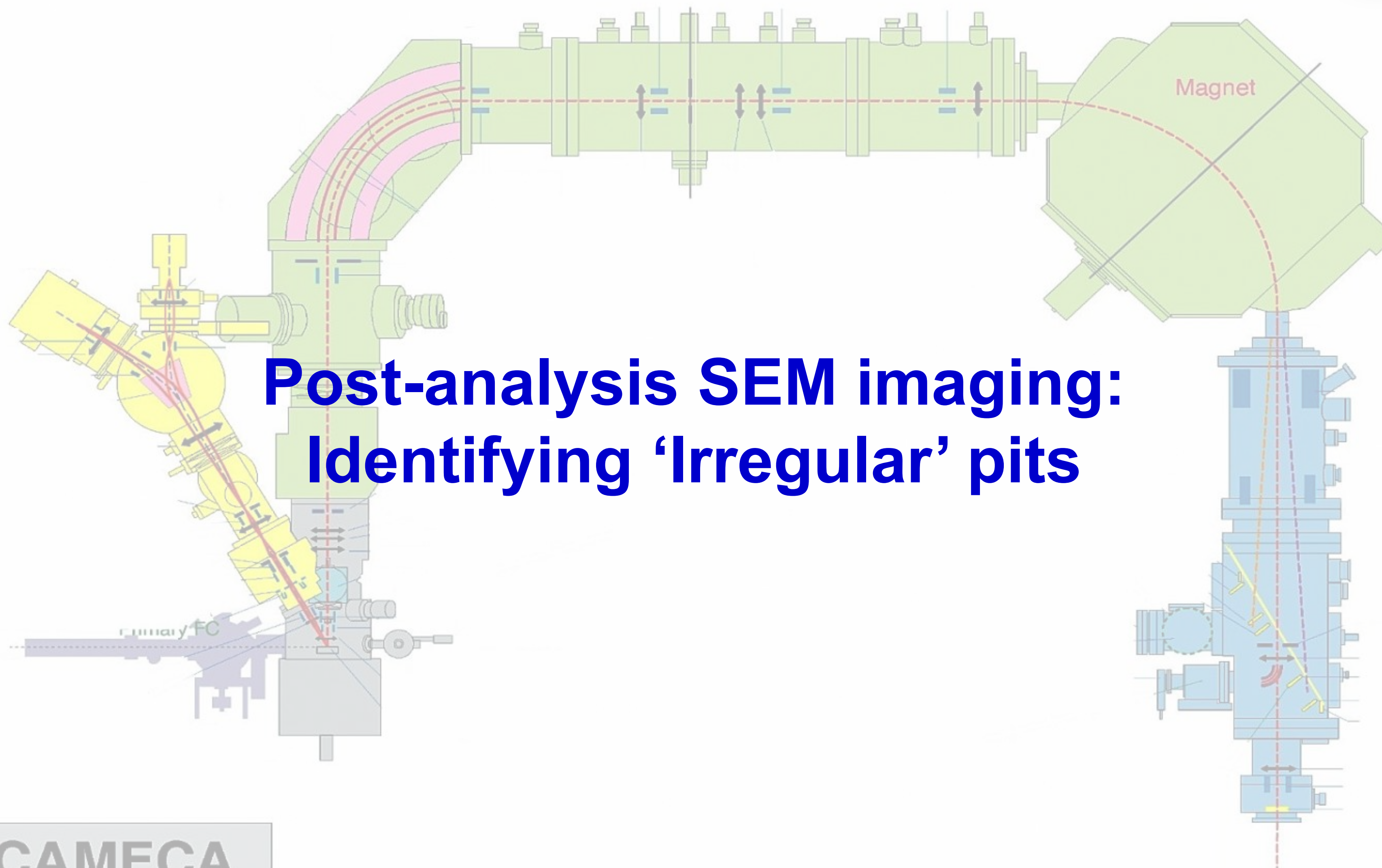
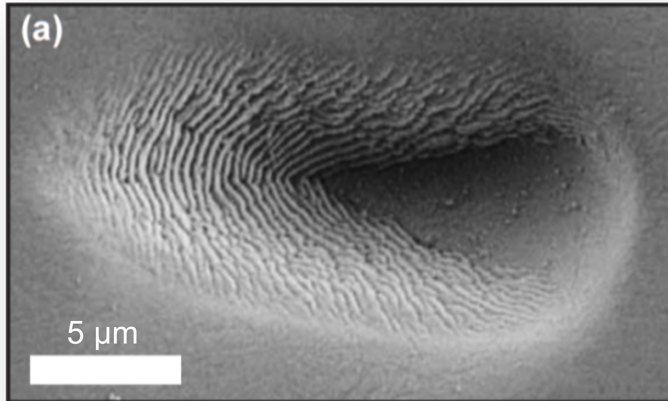
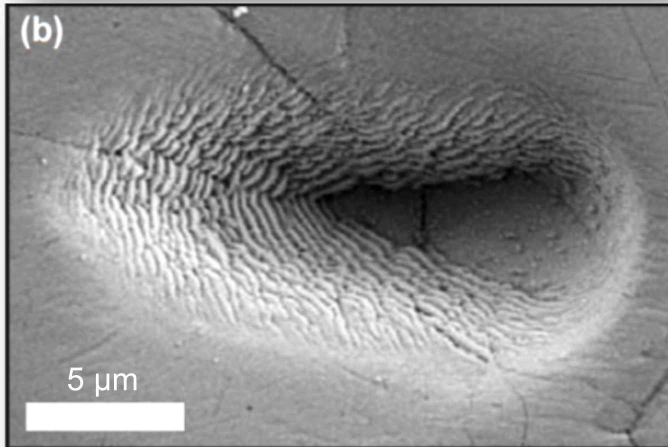
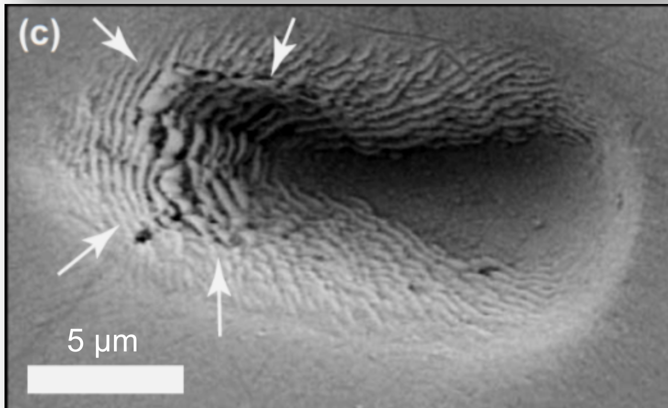
Post-analysis SEM imaging: Identifying ‘Irregular’ pits









Cavosie et al. 2005, EPSL
doi:10.1016/j.epsl.2005.04.028

Examples of 'regular' and 'irregular' ion microprobe pits in zircon following $\delta^{18}O$ analysis

(a) '**Regular**' pit, showing slight asymmetry due to inclination of primary beam

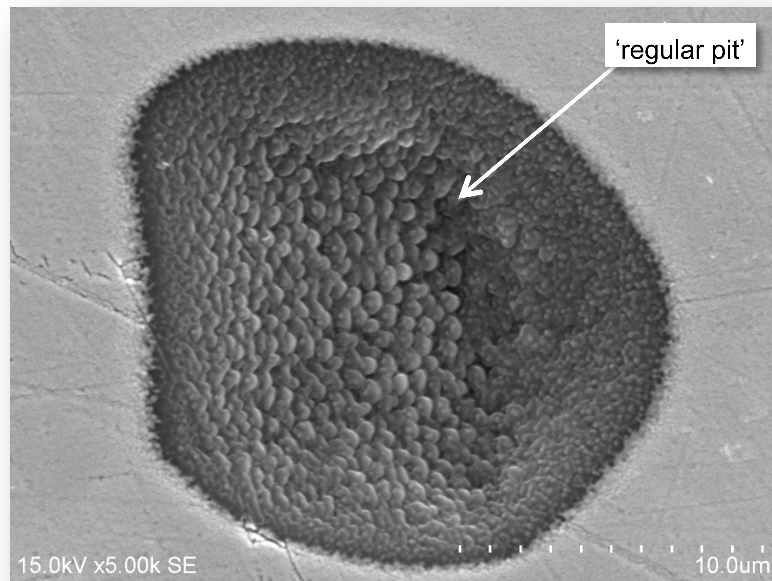
(b) '**Irregular**' pit with through-going cracks, visible in the crater walls and floor

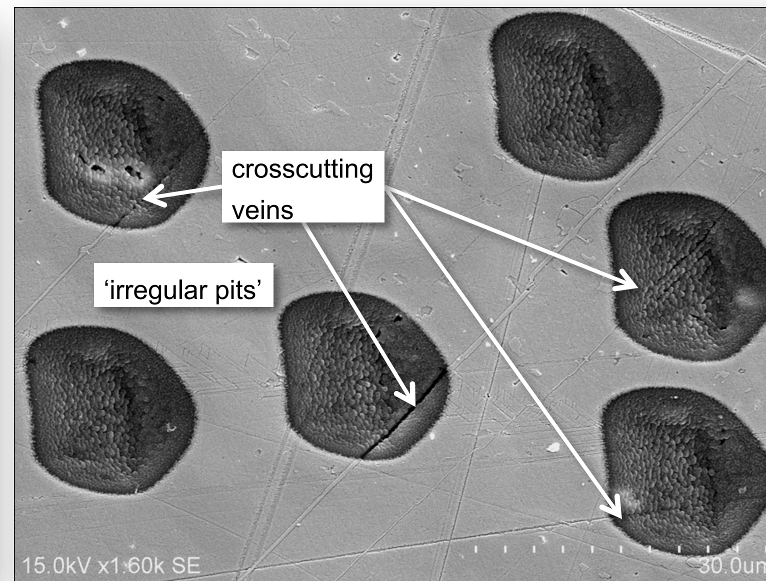
(c) '**Irregular**' pit with a circular 'cavity' at the left side (defined by arrows). The analysis hit a mineral inclusion. Preferential sputtering of the inclusion is thought to have caused this feature. Pits are approximately 2-3 µm in depth.

It is tempting to accept data from 'irregular' pits. Such features often have no measurable affect on isotope ratio, however non-systematic and sometimes large shifts in measured $\delta^{18}O$ (up to +12‰ reported by Cavosie et al., 2005) demonstrate the importance to describe and evaluate 'irregular' pits.

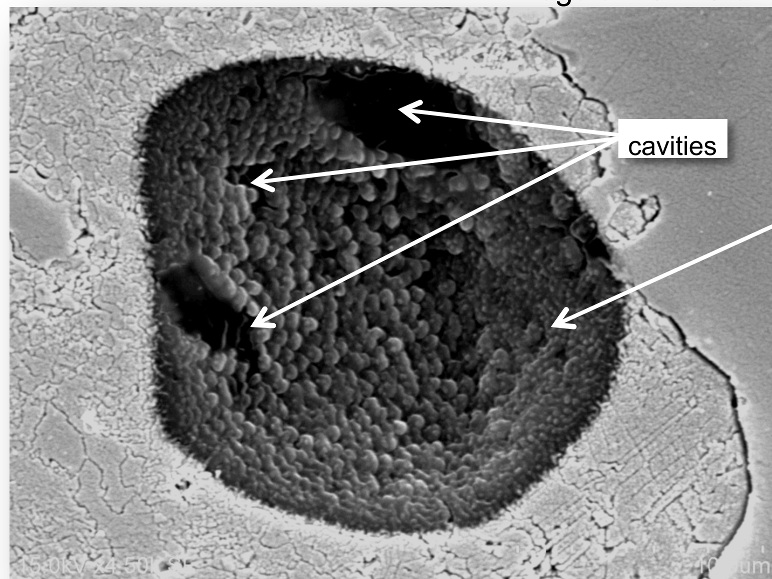
Examples of ‘regular’ and ‘irregular’ ion microprobe pits in carbonates

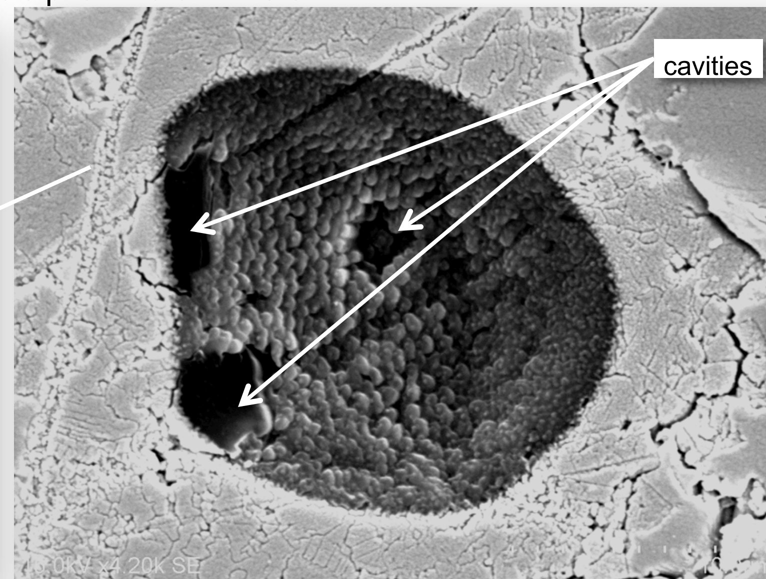
SIMS analysis pits in UWC-3 standard (metamorphic calcite)

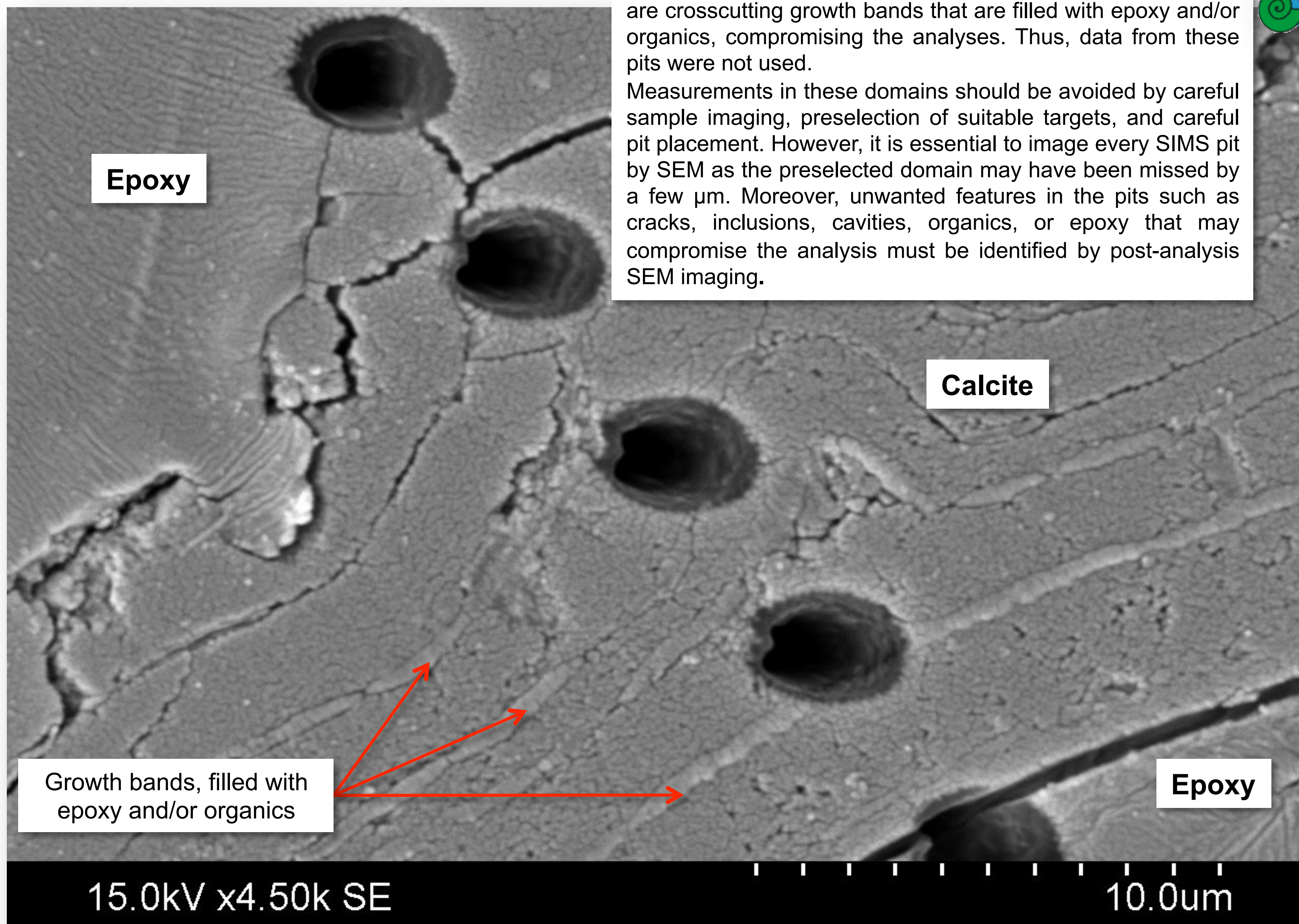




“Irregular” SIMS analysis pits in foraminifera






SE image of an Au-coated sample, showing a foraminiferal chamber wall with ~3 µm SIMS analysis pits. Some of the pits are crosscutting growth bands that are filled with epoxy and/or organics, compromising the analyses. Thus, data from these pits were not used.
Measurements in these domains should be avoided by careful sample imaging, preselection of suitable targets, and careful pit placement. However, it is essential to image every SIMS pit by SEM as the preselected domain may have been missed by a few µm. Moreover, unwanted features in the pits such as cracks, inclusions, cavities, organics, or epoxy that may compromise the analysis must be identified by post-analysis SEM imaging.
WiscSIMS
Epoxy
Calcite
Growth bands, filled with epoxy and/or organics
Epoxy
15.0kV x4.50k SE
10.0um