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Skeletal growth phases of the cold-water coral *Lophelia pertusa* shown by scanning electron microscope and electron backscatter diffraction

Vincent Mouchi (1,2), Pierre Vonlanthen (3), Eric P. Verrecchia (4), and Quentin G. Crowley (2)

(1) Sorbonne Universités, UPMC Univ. Paris 06, CNRS UMR 7193, ISTEP, F-75005, Paris, France (vincent.mouchi@upmc.fr), (2) Department of Geology, School of Natural Sciences, Trinity College, Dublin, Ireland, (3) Institute of Earth Sciences, FGSE, Géopolis, University of Lausanne, CH-1015 Lausanne, Switzerland, (4) Institute of Earth Surface Dynamics, FGSE, Géopolis, University of Lausanne, CH-1015 Lausanne, Switzerland

Lophelia pertusa is a cold-water coral, which may form reefs by the association of multiple coralites within which a polyp lives. Each individual polyp builds an aragonite skeleton by an initial phase of early mineralization (traditionally referred to as centres of calcification) from which aragonite fibres grow in thickening deposits. The skeleton wall features successive optically opaque and translucent bands previously attributed to different regimes of growth as either uniform in crystal orientation (translucent bands) or with a chaotic organization (opaque bands). The processes involved in any organizational changes are still unknown.

Microlayers in the coral wall, which represent separate periods of skeletal growth, have been recently identified and described. These growth patterns are readily visible under scanning electron microscope (SEM) after etching in dilute formic acid, but they do not necessarily form continuously visible structures. Here we present high quality SEM images and electron backscatter diffraction (EBSD) maps to study aragonite fibre orientation across the wall of *L. pertusa*. Both microlayers and opaque and translucent bands are compared to the crystallographic orientation of the aragonite fibres.

EBSD maps and SEM images indicate that aragonite fibres do not exhibit a chaotic orientation, even in opaque bands. The absence of continuity of microlayers is partially explained by an association of multiple crystallographic preferred orientations of aragonite fibres. In the case of *L. pertusa*, careful textural characterisation is necessary prior to elemental or isotope analysis in order to select a skeletal transect representing a linear and continuous time period.