Supplementary Information

Microstructures, crystallography and growth patterns of serpulid tubeworms (Class Polychaeta)

Authors

Christian Grenier[1], Katarzyna Berent[2], Alejandro B. Rodríguez-Navarro[3], Olev Vinn[4], Antonio G. Checa[1,5]*

[1]Departamento de Estratigrafía y Paleontología, Universidad de Granada, 18071 Granada, Spain.

[2]Academic Centre for Materials and Nanotechnology, AGH University of Krakow, 30-059 Kraków, Poland.

[3]Departamento de Mineralogía y Petrología, Universidad de Granada, 18071 Granada, Spain.

[4]Department of Geology, Institute of Ecology and Earth Sciences, University of Tartu, 50411 Tartu, Estonia.

[5]Instituto Andaluz de Ciencias de la Tierra, CSIC-Universidad de Granada, 18100 Armilla, Spain.

Supplementary Figures S1 to S6

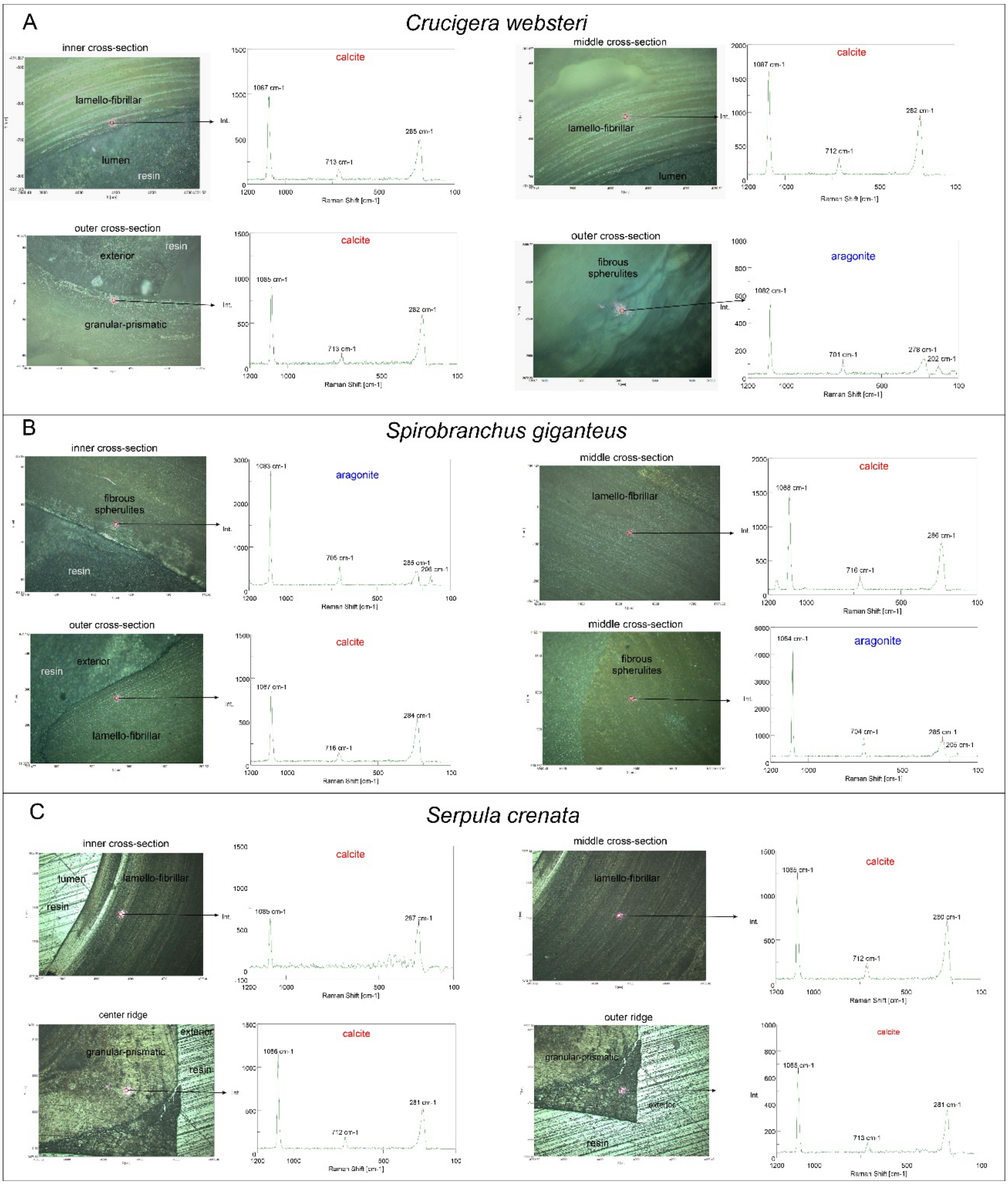

Figure S1. Raman spectroscopy of *Crucigera websteri* (A), *Spirobranchus giganteus* (B) and *Serpula crenata* (C). The analyses were performed on different parts of the tube cross-section (inner, middle, and outer). The mineralogy of the different microstructures analyzed is indicated.

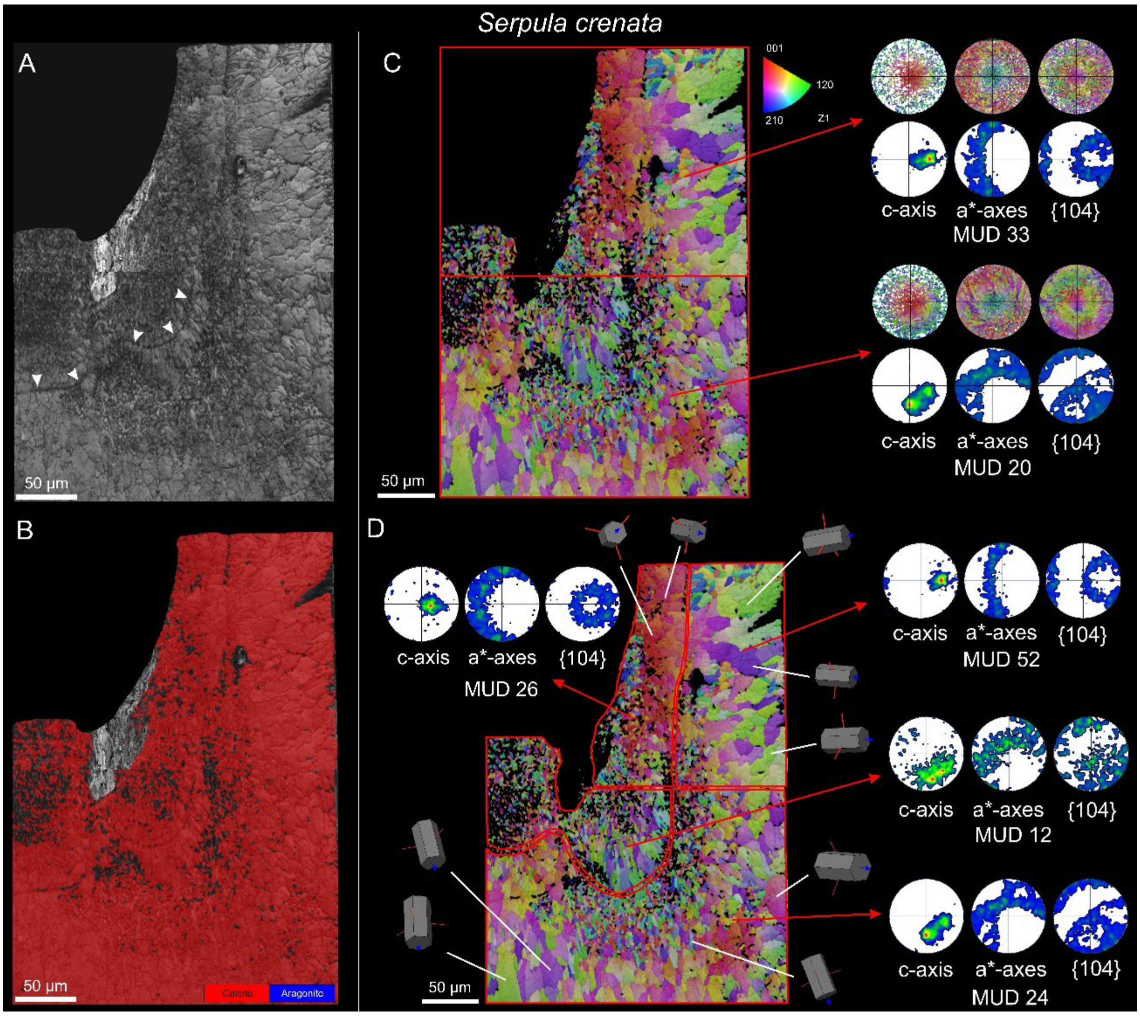

Figure S2. EBSD analysis of the granular-prismatic calcite (coarse prismatic layer) of a ridge of *S. crenata*. Given the large area covered, the analysis was done over two contiguous maps (framed in C). A. The band contrast maps show a good EBSD diffraction signal (light-grey color). Some arc-shaped growth lines are visible in the central part (white arrowheads). B. The phase maps indicate that the entire structure is made of calcite (red color, see legend). C. The two IPFz maps predominantly exhibit green, red, and purple colors, the latter indicating that the prisms' c-axes are roughly oblique to the section plane. Their respective pole figures show a medium axial texture (MUD values of 33 and 20), with the c-axis maxima placed from the center. The c-axis maximum is wider in the pole figure of the bottom map, due to the curvature of the ridge. D. The same IPFz maps with differentiation of the internal and external regions. The pole figure maxima exhibit slightly more perpendicular c-axes (also depicted by the unit cells) in the inner regions. The maxima become narrower and the MUD values increase (from 26 to 52 at the top, and from 12 to 24 at the bottom) toward the exterior. The color triangle is the orientation key.

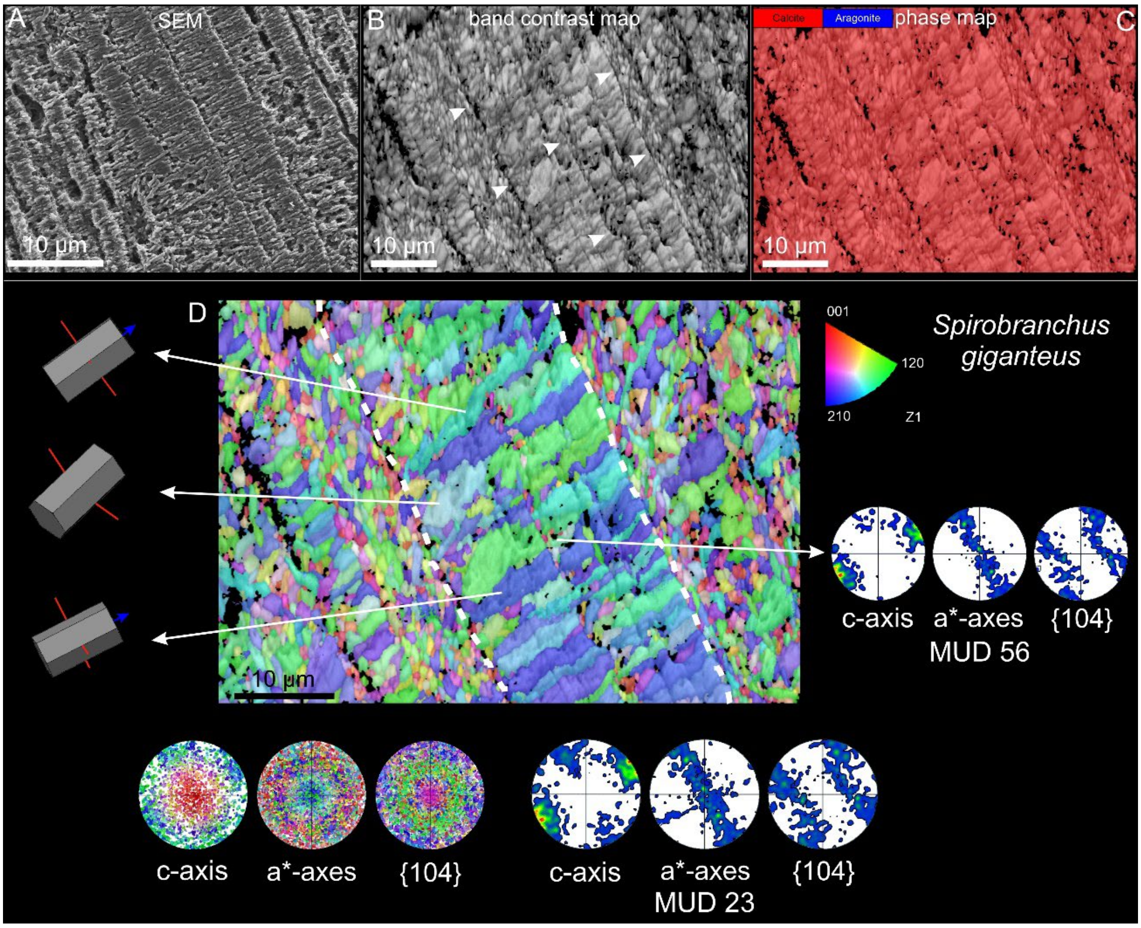

Figure S3. EBSD analysis of a polished surface of the finely granular-prismatic calcite of *S. giganteus*, transversal to the tube. A. SEM image of a surface similar to that analyzed with EBSD. B-D. Surface analyzed. B. Band contrast map. The light-grey color of the whole map denotes a good EBSD signal strength. The contours of the prisms are easily recognizable. They are arranged perpendicular to the vestigial membranes (white arrowheads). There is a central coarse prismatic layer. C. Phase map. The entire map is made of calcite (see legend). D. IPFz map and pole figures. Green-blue-purple colors predominate, indicating that the c-axes of most of the prisms are parallel to the section plane. This is corroborated by the unit cells and the position of the c-axis maximum. The pole figures display a weak axial texture (MUD value 23). The pole figures for the central coarse prismatic layer, delineated by broken lines, give a medium axial texture (MUD value 56). The color triangle is the orientation color key.

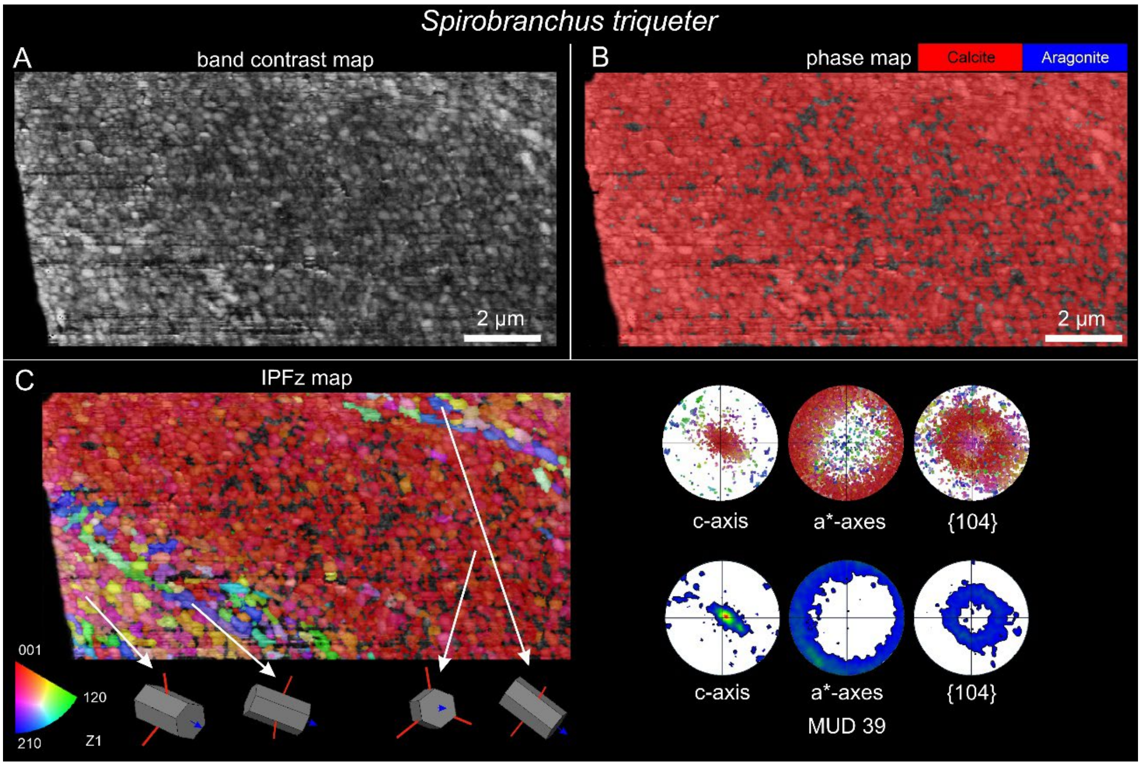

Figure S4. EBSD analysis of a FIB-prepared lamella of the lamello-fibrillar calcite of *S. triqueter*. A. Band contrast map. The contours of the transversely sectioned fibers are recognizable. B. Phase map. The entire structure is made of calcite (see legend). C. The IPFz map shows a predominant red color in the central oblique band, indicating that the fibers have their c-axis at a high angle to the sectioning plane. Given the high surface contribution of this band, the c-axis pole figures have prevalent central maxima. The MUD value (39) indicates a medium axial texture. Some fibers of the oblique stripes at the top and bottom are roughly parallel to the plane (see the unit cells). The color triangle is the orientation color key.

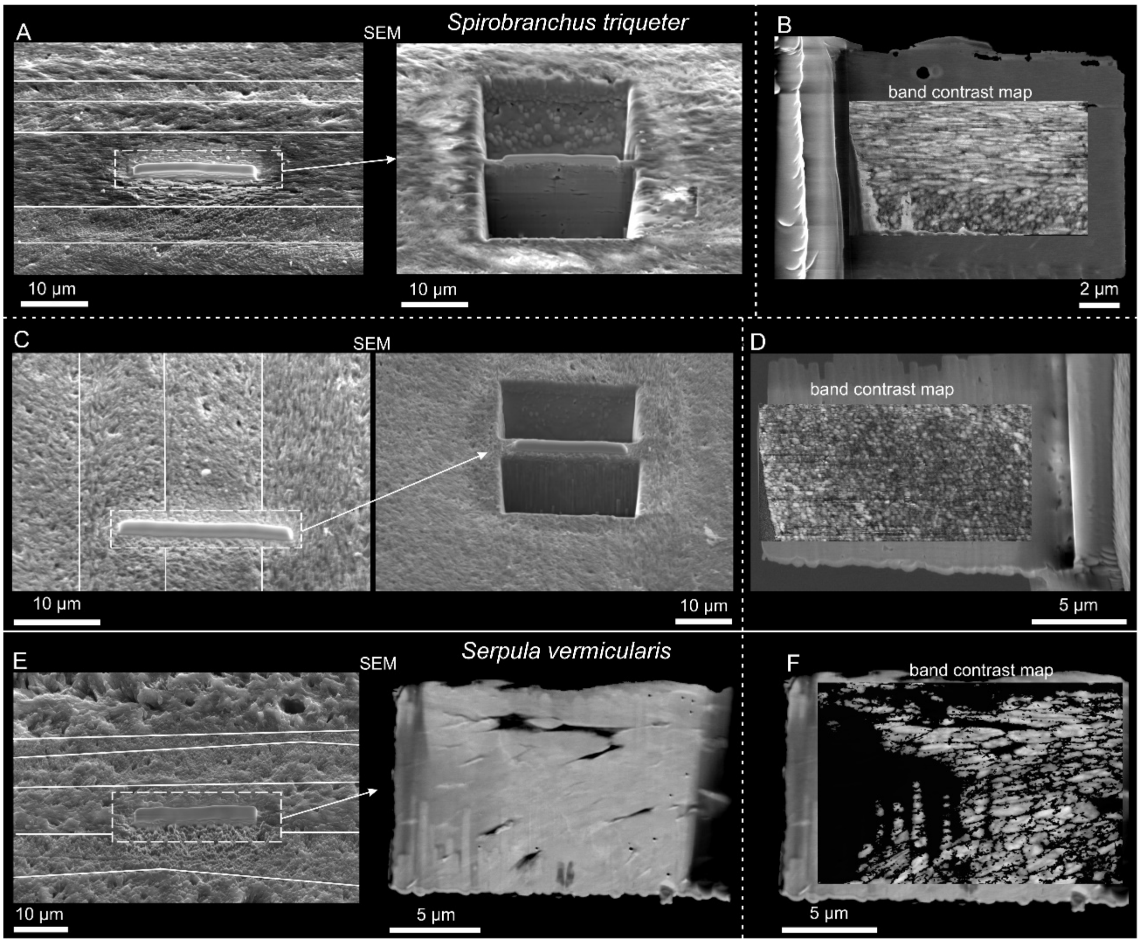

Figure S5. Thin foil lamellae prepared by the FIB technique on the lamello-fibrillar microstructure in *S. triqueter* (A-D) and *S. vermicularis* (E-F). The examples correspond to the EBSD results shown in Figures 7 (A, B, E, F) and S4 (C, D). A, C, and E are SEM images of the areas selected, either along (A, E) or transversal (C) to the growth increments (arrows). Intermediate stages of the preparation are shown in A and C, and a SEM view of the lamella is provided in E. B, D, and F. The extracted lamellae with their respective band contrast maps superimposed, indicating the areas analyzed by EBSD.

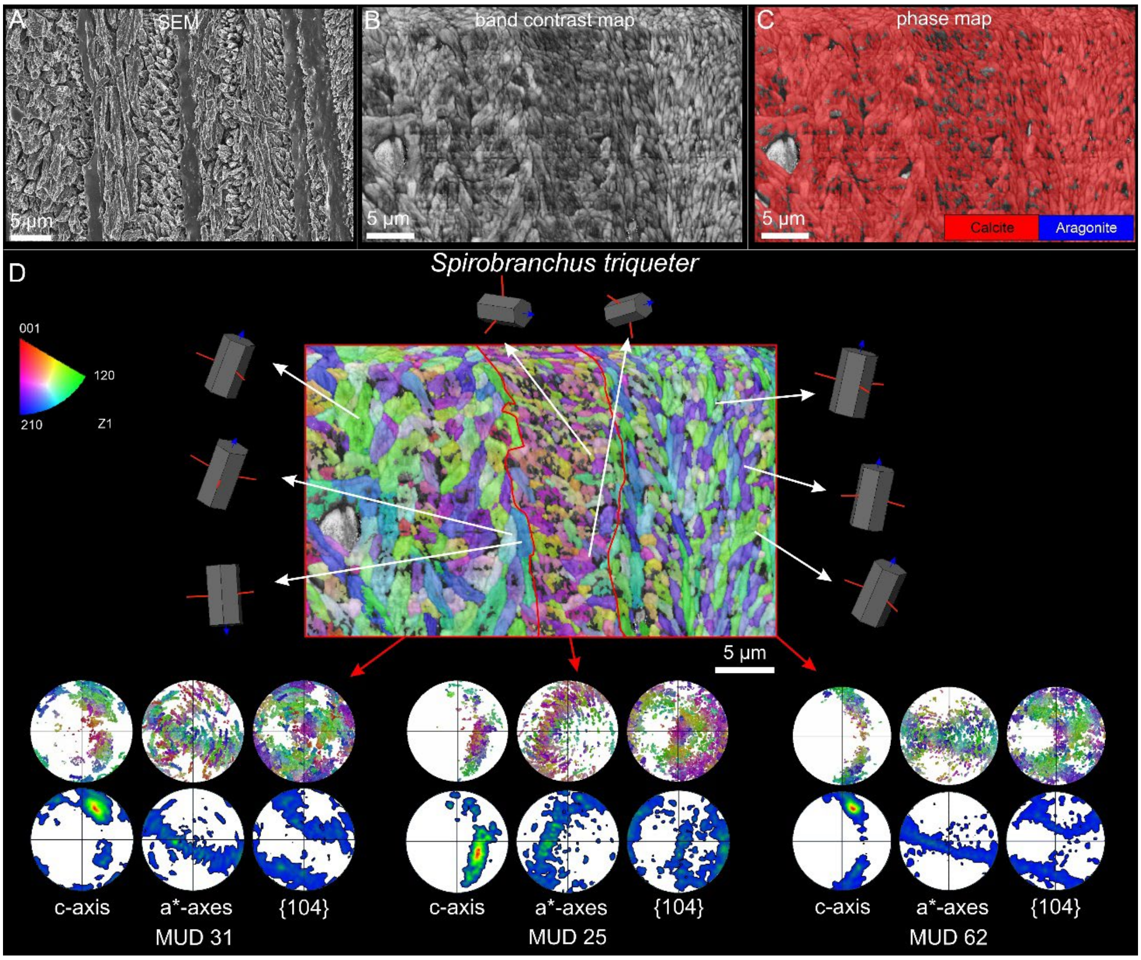

Figure S6. EBSD analysis of a polished surface of the lamello-fibrillar calcite of *S. triqueter*. A. SEM image of a surface from a transversal tube cross-section, similar to that analyzed by EBSD. B. Band contrast map, exhibiting a good EBSD signal strength (light-grey color). The contours of the fibers are easily recognizable, being smaller and thinner in the right area. C. Phase map. It is entirely made of calcite (see legend). D. IPFz map and pole figures. Three different layers were analyzed. In the lateral layers, the c-axes of the fibers are roughly in plane, while in the central layer, the c-axes are at a high angle (see cell lattices). The pole figures display a better co-orientation of the fibers of the right layer (medium axial texture, MUD value 62), than those of the central and left layers (MUD values 25 and 31, respectively). The color triangle is the orientation color key.