On the consolidation state of sediments from the accretionary prism offshore Vancouver Island, North Cascadia Margin

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In this section, we describe the major lithological units identified at the drill sites of IODP Expedition 311 as used in Table 1 and shown in Figures 11 – 14. For a complete description, please consult the proceedings volume (Riedel et al., 2006) and expedition related bibliography provided online (<http://publications.iodp.org/proceedings/311/311title.htm>, last accessed April 29, 2022).

**Site U1325**

Site U1325 is located within the first slope basin along the Expedition 311 transect, ~ 5 km east of the deformation front and first accreted sediment ridge. Based on the recovered sediments from four drill holes, the sedimentary section was divided into four lithostratigraphic units.

Lithologic unit I (< 0.3 Ma) was defined up to a depth of 52.2 mbsf and was subdivided further into two sub-units. Subunit IA is composed of dark greenish gray silty clay with diatoms, diatom silty clay, silty clay, and notably black sand, which is absent from subunit 1B.

Lithologic unit II (> 0.3 Ma) was defined between 52.2 – 102.3 mbsf. Unit II is composed of dark gray clay, dark greenish gray silty clay, and clayey silt, locally interbedded with frequent dark gray quartz sand, very dark gray silty sand, and dark gray sandy silt layers.

Lithologic unit III (> 0.3 Ma) extends up to ~198 mbsf and is composed of dark greenish gray and dark gray clay, silty clay, silty clay with diatoms, nannofossil silty clay, and nannofossil ooze. The biogenic components with a high content of diatoms and nannofossils in Unit III are distinctly different from Unit II.

Lithologic unit IV (> 0.3 Ma) was defined to occur deeper than 198 mbsf. Unit IV is mainly composed of dark gray and dark greenish gray clay and silty clay, locally interbedded with coarser-grained sediment of sand, silty sand, and silt layers. Biogenic components are almost absent in Unit IV.

**Site U1326**

Site U1326 is located at the western end of the Expedition 311 transect, at the first uplifted accreted sediment ridge near the deformation front. Sediments from this site were divided into three lithostratigraphic units.

Lithologic unit I (< 0.3 Ma) extends to a depth of ~ 24.1 mbsf s and is mainly composed of dark gray and dark greenish gray silty clay and clay with diatoms. The major biogenic components of Unit I are diatoms but some foraminifers occur as well.

Lithologic unit II (> 0.3 Ma) is defined from 24.1 – 146.3 mbsf. Unit II is composed of dark gray clay, silty clay, and dark olive-gray clay, locally interbedded with dark gray silt, silty sand, and sand layers. Biogenic components are almost absent in Unit II. There are no diatoms and foraminifers, nannofossils, and organic fragments are rarely found.

Lithologic unit III (> 0.3 Ma) extends from 146.3 mbsf to total depth drilled and is composed of dark greenish gray and dark gray clay, clay with diatoms, silty clay, and silty clay with diatoms. Coarser grained silt, to sand fractions occur as minor lithologies. The biogenic components differ distinctly from those seen in Unit II. Unit III contains some fossils (diatoms, foraminifers, siliceous spicules) and organic debris.

**Site U1327**

Site U1327 is located on the mid-continental slope off Vancouver Island at the centre of the drilling transect. The 300 m thick sedimentary section recovered was divided into three lithostratigraphic units.

Lithologic unit I (Quaternary) is defined up to a depth of 90 mbsf. Unit I is composed of dark greenish gray and dark gray clay and silty clay, interbedded with silt, sandy silt and sand/gravel layers. Only very few biogenic components were found. The Unit I/II boundary is marked by a sharp decrease of sand and silt layers, and by an increase in the abundance of diatoms, which can be seen as a change in sediment color.

Lithologic unit II (> 0.3 Ma – 1.0 Ma) extends from 90 mbsf to ~ 170 mbsf. Unit II is composed of dark greenish gray and dark gray clay, clay with diatoms, and silty clay, all locally interbedded with sandy silt and sand layers/lenses. The biogenic components of Unit II are distinctly different from those seen in Unit I. The major lithology in Unit II shows a high diatom content, but a very low carbonate nannofossil fraction (< 1%).

Lithologic unit III (> 1.0 Ma) extends from ~ 170 mbsf to total depth drilled (300 mbsf). Unit III is mainly composed of dark greenish gray silty clay and dark gray silty clay and clay. Unit III is distinguished from Unit II by the sudden absence of diatoms as well as the degree of induration of the sediments.

**Site U1329**

Site U1329 is the easternmost and shallowest (~946 m water depth) site of the drilling transect. The 187.5 m thick sedimentary section recovered was divided into three lithostratigraphic units.

Lithologic unit I (> 0.3 Ma) extends to a depth of ~ 37.2 mbsf and is composed of dark greenish gray and dark gray clay and silty clay, locally interbedded with silt, clayey silt, and sand layers/lenses. The biogenic components have mostly very low concentrations. The Unit I/II boundary is marked by the first occurrence of diatom ooze, which can be seen as a distinct change in color.

Lithologic unit II (> 0.3 – 2.0 Ma) is defined between 37.2 and 135.6 mbsf and is composed of dark greenish gray and dark olive-gray clay, silty clay, silty clay with diatoms, and diatom ooze locally interbedded with silt, clayey silt, sand, and foraminifer ooze layers. The composition of the biogenic components is characteristic of Unit II, in particular the high content of diatoms forming diatom ooze. The Unit II/III boundary is marked by the occurrence of a conglomerate and follows a stratigraphic hiatus where no sediments is preserved from 2 to 6.7 Ma.

Lithologic unit III (> 6.7 Ma) occurs deeper than 135.6 mbsf and is mainly composed of dark greenish gray, dark olive-gray, and dark gray clay and silty clay. Coarser grained, interbedded silt and sand layers are very rare and almost barren of biogenic components.

**References**

Riedel M, Collett TS, Malone MJ, and the Expedition 311 Scientists (2006) Proc. IODP, 311: Washington, DC (Integrated Ocean Drilling Program Management International, Inc.). doi:10.2204/​iodp.proc.311.2006