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Vertical Distribution and Controlling Factors of Soil Inorganic Carbon in Poplar Plantations of Coastal Eastern China

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摘要 Afforestation is a strategy to protect croplands and to sequestrate carbon in coastal areas. In addition, inorganic carbon is a considerable constitute of the coastal soil carbon pool. However, the vertical distribution and controlling factors of soil inorganic carbon (SIC) in plantations of coastal areas have been rarely studied. We analyzed the SIC content as well as physiochemical properties along soil profiles (0–100 cm) in young (YP) and mature (MP) poplar plantations in coastal eastern China. The soil profile was divided into six layers (0–10, 11–20, 21–40, 41–60, 61–80 and 81–100 cm) and a total of 36 soil samples were formed. The SIC content first increased from 0–10 cm (0.74%) to 11–20 cm (0.92%) and then fluctuated in the YP. In contrast, the SIC content increased with increasing soil depth until 40 cm and then leveled off, and the minimum and maximum appeared at 0–10 cm (0.54%) and 81–100 cm (0.98%) respectively in the MP. The soil inorganic carbon density was 12.05 and 12.93 kg m?2 within 0–100 cm in the YP and MP, respectively. Contrary to SIC, soil organic carbon (SOC) first decreased then levelled off within the soil profiles. Compared with the YP, the SIC content decreased 27.8% at 0–10 cm but increased 13.2% at 21–40 cm, meanwhile the SOC content in MP decreased 70.6% and 46.7% at 21–40 cm and 61–80 cm, respectively. The water-soluble Ca2+ and Mg2+ gradually decreased and increased, respectively within the soil profiles. The soil water-soluble Ca2+ increased 18.3% within 41–100 cm; however, the soil water-soluble Mg2+ decreased 32.7% within 21–100 cm in the MP when compared to the YP. Correlation analysis showed that SIC was negatively correlated with SOC, but positively correlated with soil pH and water-soluble Mg2+. Furthermore, structural equation modeling (SEM) indicated that SOC was the most important factor influencing the SIC content in the studied poplar plantations, indicating SOC sequestration promoted the dissolution of SIC. Therefore, our study highlights the

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