

**Morphology and distribution of dolines on ultramafic rocks 1 from airborne 2 LIDAR data- the case of southern Grande Terre in New Caledonia (SW Pacific)
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Dolines are closed geomorphological depressions which are surface manifestations of karstic systems. Usually developed on limestone, they also typify the morphology of the New Caledonian landscape, particularly on the southern massif of the main island (known as Grande Terre). These dolines are evidence of subsidence, suffosion and collapse phenomena resulting from dissolution weathering of peridotites. However, extensive underground drainage systems are still not yet recognized. Semi-automatic mapping of dolines is carried out on a 148 km² area of the Massif du Sud from a high accuracy LIDAR digital elevation model. 8,601 dolines ranging from 1 m² to 2 km² are identified and morphologically characterized with precision. The majority of them are small, shallow and round-shaped, yet more complex shapes are locally observed. Size distribution analysis allows the setting of a threshold of 20,000 m² above which surface processes rather than chemical weathering control doline evolution. Doline density analysis reveals high concentrations on flat areas where ferricrete overlies the complete weathering profile, especially in the case of elevated, rainy watersheds. Dolines are aligned and elongated along a N 135 A 5° major fracture direction, which is inherited from the obduction of the Pacific Plate upper mantle in the Late Eocene. Finally, we propose a pioneering morphometric typology of dolines that provides important clues as to pseudokarstic activity. We define collapse, bowl-shaped and flat bottom dolines. Collapse and bowl-shaped dolines are assumed to denote active pseudokarst. They may widen and deepen, or eventually be filled by sediments. They are distinguished from flat bottom dolines that are partially to completely filled, which suggests that they are associated with paleo-pseudokarsts. However the groundwater flow paths associated with the genesis and evolution of dolines must be clarified, and collapse and bowl-shaped dolines should be hydrologically monitored.

