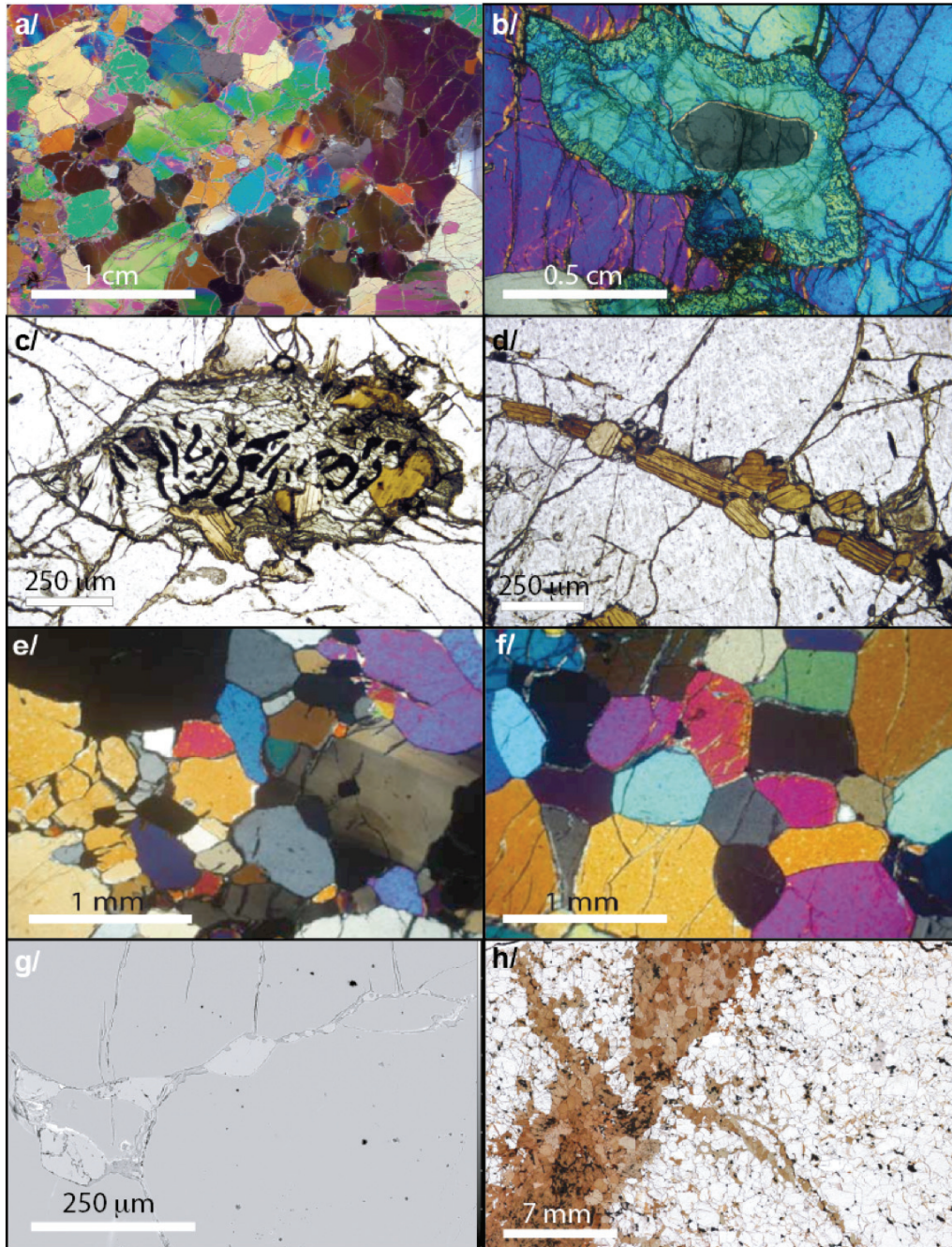
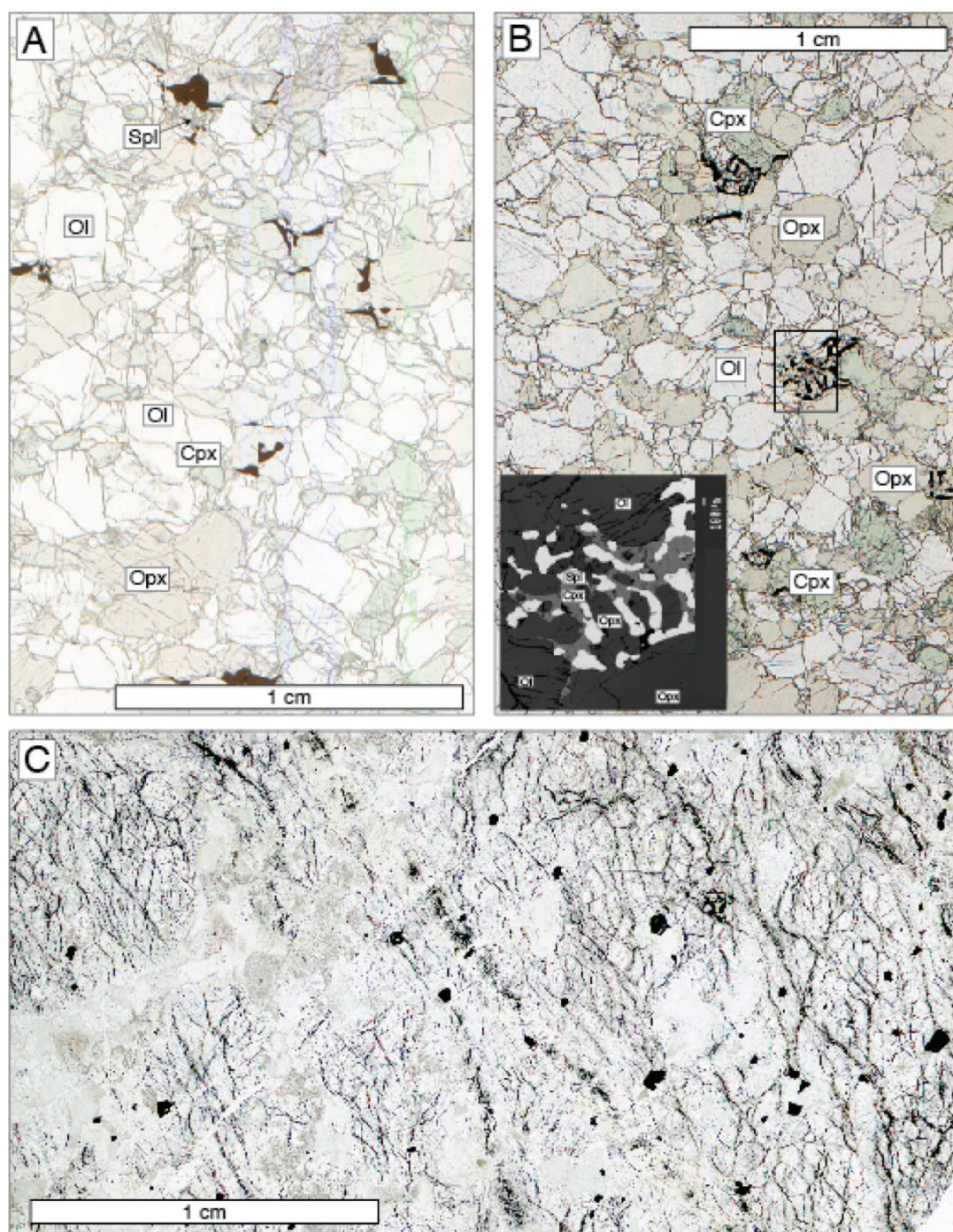


Supplementary material



Supplementary Fig.1. Photomicrographs of microstructures in Kerguelen peridotite xenoliths. **(1A)** Protogranular harzburgite GM92-31 (Bascou et al., 2008). **(1B)** Poikilitic clinopyroxene with spongy rims enclosing orthopyroxene in a poikilitic harzburgite interpreted as product of interaction between protogranular harzburgites and alkaline basaltic melt. **(1C)** Poikilitic clinopyroxene in poikilitic harzburgite OB93-03 enclosing vermicular spinel and phlogopite (Moine et al., 2000). **(1D)** Phlogopite veinlet cross-cutting poikilitic harzburgite OB93-03. **(1E)** Unequigranular dunite MG91-114. **(1F)** Equigranular dunite MM94-97. **(2G)** BSE image of interstitial carbonate grains (Mg-Calcite) in dunite GM92-140. **(1H)** Hornblendite dyklet cross-cutting dunite MG91-144 (Moine, 2000).



Supplementary Fig. 2. (2A) A plane polarised light view of a typical Type 1 peridotite from the Auckland Islands. **(2B)** A Type 2 peridotite from the Auckland Islands. Note the symplectitic pyroxene and spinel intergrowths, which are also shown in the backscattered electron image inset. **(2C)** Serpentinised peridotite from Macquarie Island. Olivine has been replaced by serpentine and magnetite, with pyroxene replaced by a mesh-textured serpentine.

Rock types	Pristine mineralogy	Grain size	Secondary mineralogy (disseminated in matrix)	Secondary mineralogy (vein or pool) occurring in rare samples	Equilibration T
Protogranular Harzburgites	ol+opx+cpx+sp	Ol and Opx: 2 to 10 mm		Cpx II, ol II, spl II and glass	
		Neoblasts of ol and opx: < 1 mm	-		845-1005°C
		Cpx and Sp: < 1 to 2 mm		Cpx II ± ol II ± amp ± phl ± spl II ± ilm ± ru ± fds ± cb ± su ± gl.	
Lac Michèle Harzburgites (protogranular/poikiloblastic)	ol+opx+cpx+sp	Ol and Opx: 1 to 5 mm		Cpx II, ol II, spl II, fds ± gl ± ap ± cb ± ru	
		Cpx and Spl: < 1 mm	-	serpentine	855-1200°C
Poikilitic Harzburgites	ol+opx+cpx+sp	Ol and Opx: 2 to 10 mm (ol up to 50 mm)		Fds + ol II + ru + ilm + Cr-arm + Cr-Ca-arm + Ti-chr	
		Neoblasts of ol and opx: < 1 mm	phl±amp±ap		1015-1135°C
		Cpx: up to 2 mm		Cpx II ± ol II ± amp ± phl ± spl II ± ilm ± ru ± fds ± cb ± su ± gl.	
Dunites (granular/lunequigranular)		Other phases: < 1 to 2 mm			
	ol+cpx+sp (±opx)	Ol: 2 to 5 mm	phl±amp±cb	Cpx II ± ol II ± amp ± phl ± spl II ± ilm ± ru ± fds ± cb ± su ± gl.	940-1090°C
		Other phases 0.1 to 2 mm			

Supplementary Table 1. Summary of Kerguelen peridotite xenoliths rock types, grain sizes, mineralogy and equilibration temperatures after Grégoire (1994), Moine (2000), Delpech (2004), Grégoire et al. (1997, 2000a-b), Moine et al. (2001, 2004), Delpech et al. (2004, 2012), Lorand et al. (2004).

Supplementary Tables 2 and 3 are given in a separate excel spreadsheet uploaded on the website