Science
AAAS

www.sciencemag.org/cgi/content/full/314/5801/970/DC1

Supporting Online Material for

Transcrystalline Melt Migration and Earth's Mantle

Pierre Schiano,* Ariel Provost, Roberto Clocchiatti, François Faure

*To whom correspondence should be addressed.
E-mail: schiano@opgc.univ-bpclermont.fr

Published 10 November, *Science* **314**, 970 (2006)
DOI: 10.1126/science.1132485

This PDF file includes:

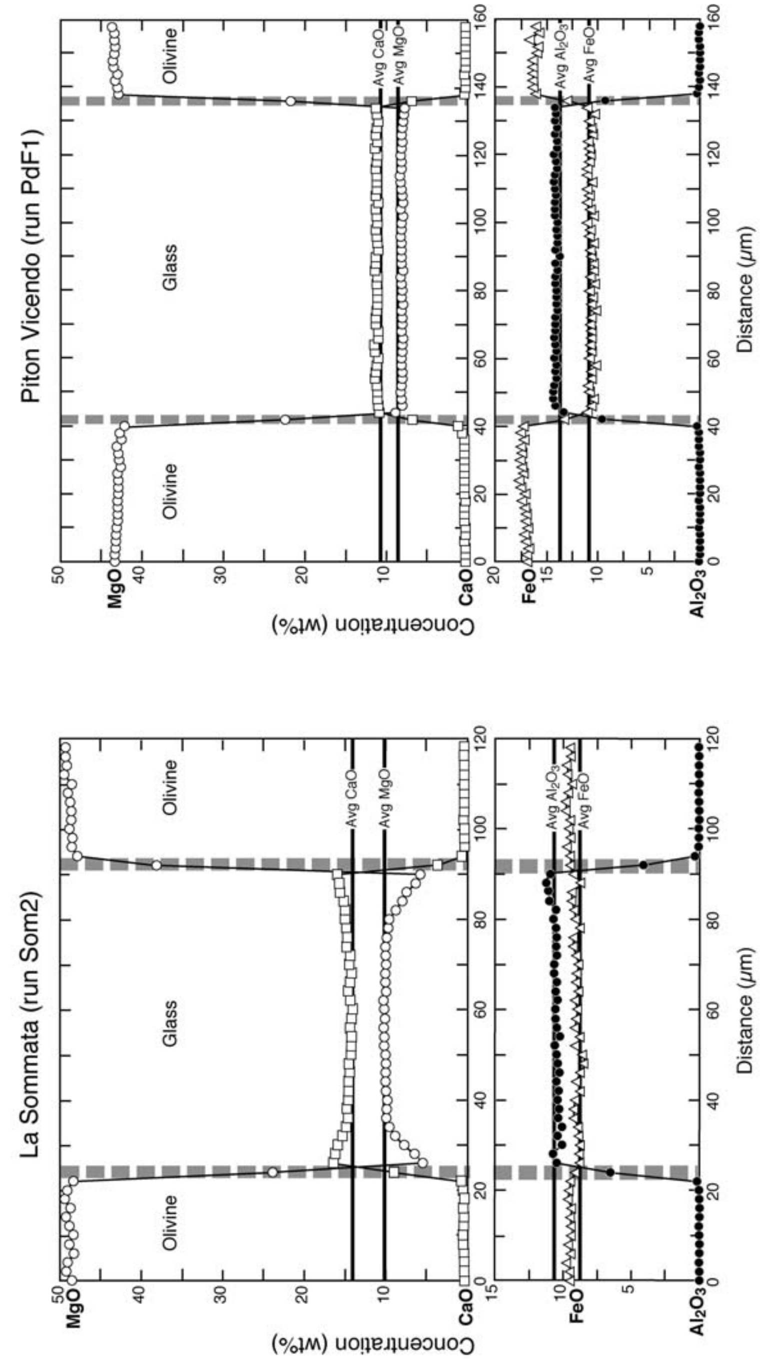
Figs. S1 and S2
Tables S1 and S2
Reference

Transcrystalline Melt Migration and the Earth's Mantle

by Pierre Schiano, Ariel Provost, Roberto Clocchiatti and François Faure

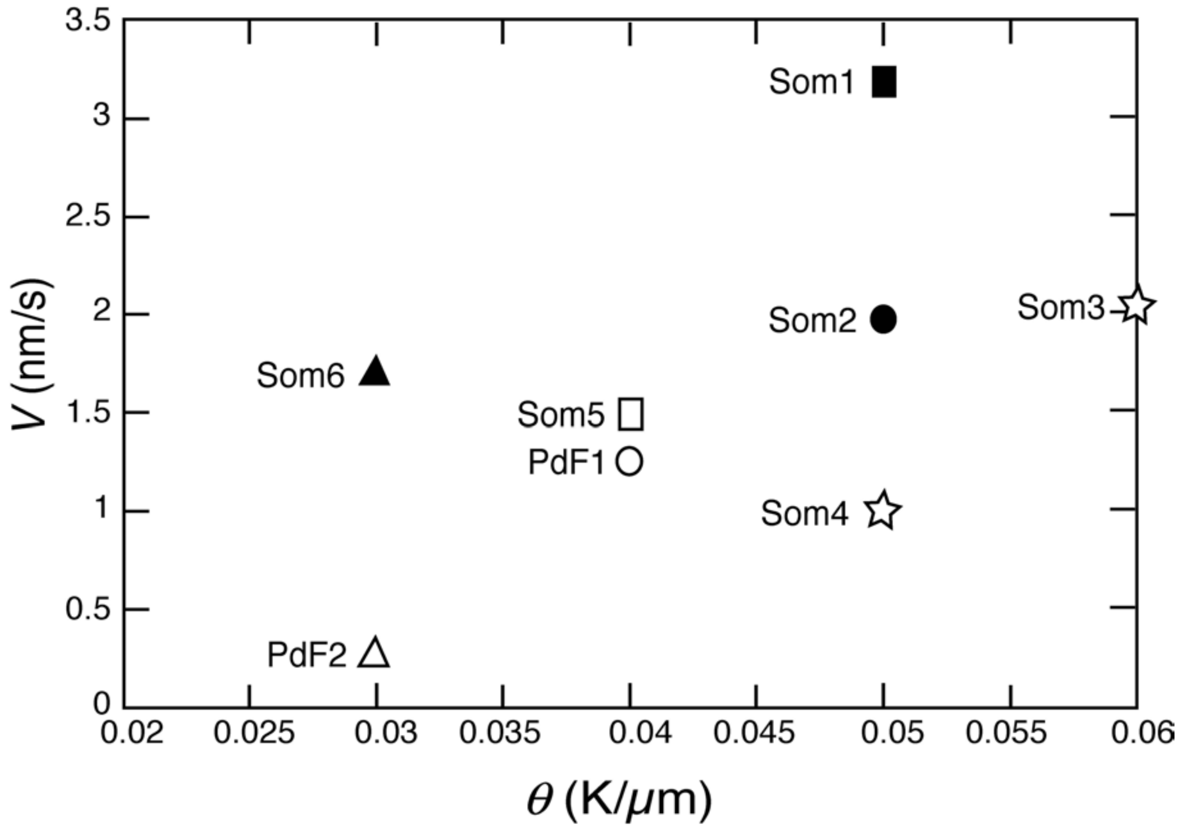
Supporting Online Material, consisting of Figures S1 and S2, Tables S1 and S2, and Reference S1

Figure S1



Compositional profiles through melt inclusions quenched at the end of runs Som2 and PdF1 (Table 1). Displayed profiles are along the [001] direction of the host crystal (i.e. parallel to melt migration path), but profiles obtained in other directions (including perpendicular) were quite similar. Electron microprobe analyses were performed at 15 kV and 10 nA, using a focussed beam and 2-μm step. Also shown for comparison are the average compositions (Avg CaO, MgO, FeO and Al_2O_3) of unheated melt inclusions from the same samples (data from refs 3 and 4), after correction for post-entrapment crystallisation of host olivine. The correction was made by incrementally adding olivine (in Fe-Mg equilibrium with the melt) until the liquidus olivine was identical to the host olivine, following the procedure described in ref (*S1*).

Figure S2



Kinetics of transcrystalline melt migration (experimental runs Som1-6 and PdF1-2, see Table 1). Migration rate V vs. thermal gradient θ, showing that V is not a function of θ only.

Table S1

Average compositions of unheated melt inclusions[a] and host olivines. n = number of analyses, Fo% (forsterite mole%) = 100 Mg/(Mg+Fe) in host olivine.

[a]Melt compositions have been corrected for post-entrapment crystallization of host olivine. The correction was made by incrementally adding olivine (in Fe-Mg equilibrium with the melt) until the liquidus olivine was identical to the host olivine, following the procedure described in ref. (*S1*).

[b]Data from ref. (*3*).

[c]Data from ref. (*2*).

	La Sommata[b] (Vulcano Island)		Piton Vincendo[c] (Reunion Island)	
	wt%	2 s.d.	wt%	2 s.d.
SiO_2	45.78	0.85	47.80	0.62
TiO_2	0.59	0.06	2.43	0.32
Al_2O_3	10.72	0.44	13.76	0.77
FeO	8.73	0.49	10.93	0.59
MnO	0.18	0.01	0.16	0.02
MgO	10.16	0.95	8.68	0.60
CaO	14.17	0.80	10.48	0.64
Na_2O	1.86	0.21	2.65	0.21
K_2O	1.83	0.26	0.68	0.11
P_2O_5	0.26	0.03	0.27	0.05
H_2O	3.70	0.10	0.74	0.07
Total	*97.98*		*98.58*	
n	7		13	
Fo%	90-91		83-84	

Table S2

Binary mixture modelling. For a simplified thermodynamic analysis, inclusion melt is considered as a binary mixture ('solution') of melted host olivine ('solute') and MgO-free liquid ('solvent'), with all molecular formulas written on a one-oxygen basis. The solute mole fraction C is $(Mg/O)_{solution}/(Mg/O)_{solute}$.

	La Sommata (Vulcano Island)			Piton Vincendo (Reunion Island)		
M	M/O Solute	M/O Solution	M/O Solvent	M/O Solute	M/O Solution	M/O Solvent
Si	0.250	0.277	0.284	0.250	0.293	0.303
Ti	0	0.003	0.003	0	0.011	0.014
Al	0	0.077	0.096	0	0.099	0.123
Fe	0.048	0.044	0.043	0.083	0.056	0.050
Mn	0	0.001	0.001	0	0.001	0.001
Mg	0.453	0.092	0	0.418	0.079	0
Ca	0	0.092	0.115	0	0.069	0.085
Na	0	0.022	0.027	0	0.032	0.039
K	0	0.014	0.018	0	0.005	0.007
P	0	0.001	0.002	0	0.001	0.002
H	0	0.150	0.188	0	0.030	0.037
Total	*0.750*	*0.772*	*0.778*	*0.750*	*0.677*	*0.660*
Mole%	20.3		79.7	19.0		81.0

Reference

S1. A. V. Sobolev, N. Shimizu, *Nature* **363**, 151 (1993).