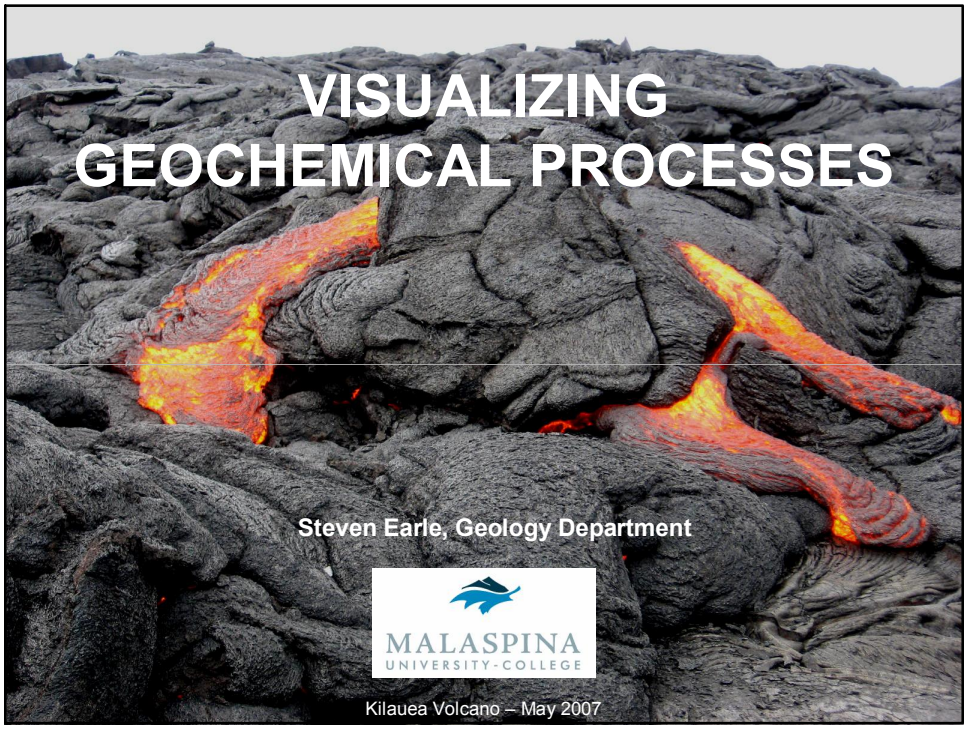

Why do we need to visualize geochemical processes?

- Earth Science students should understand some important geochemical processes.
- Most people (including me) find that even simple chemical processes are difficult to understand.
- Geochemical processes can be even more difficult.
- Paper models allow students to observe elemental proportions and to manipulate reaction processes.

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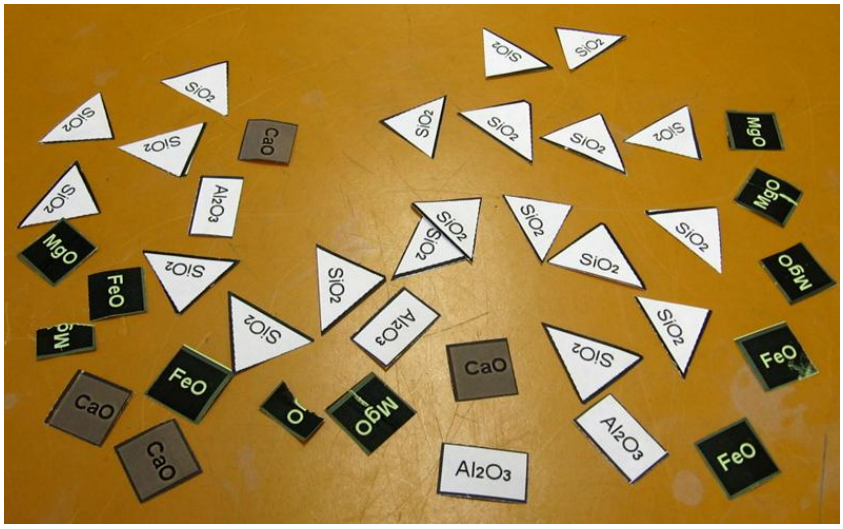
Mid-Ocean Ridge Basalt



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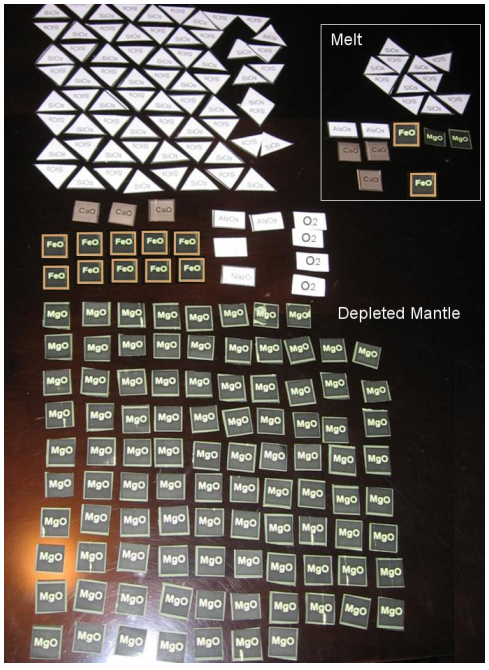

Ocean Island Tholeiite

Magma and depleted mantle rock after 10% melting

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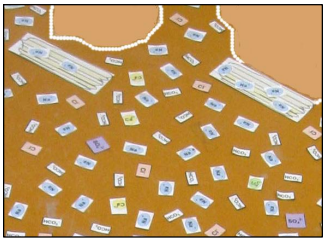
Modelling base-exchange softening in a sandstone aquifer



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Simplified mole per cent oxide proportions in felsic and mafic magmas

	Felsic	Mafic
SiO_2	71%	45%
Al_2O_3	10%	18%
FeO	3%	9%
CaO	5%	10%
MgO	3%	9%
Na_2O	4%	6%
K_2O	2%	1%
H_2O	2%	2%
	100%	100%

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Idealized oxide proportions in the common minerals in igneous rocks

	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	H_2O
Olivine	2		(4)		← any combination adding to 4			
Pyroxene	4		(4)			← any comb. adding to 4		
Amphibole	4	2	2*		1*	1*	1*	1*	1
Biotite	4	2	1		1			1	1
K-feldspar	6	2					2	
Quartz	9							
Anorthite	4	4			2			
Albite	6	2				2		

*Amphibole can have any combination of these adding to 6, but not more than 2 of any one

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The concept of using paper models to visualize geochemical processes can be applied in many areas:

- **Igneous petrology** (e.g. partial melting, fractional crystallization, sequential crystallization)
- **Metamorphic petrology**
- **Chemical sedimentation**
- **Weathering**
- **Water-rock interactions**
- **Ore-forming processes**

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