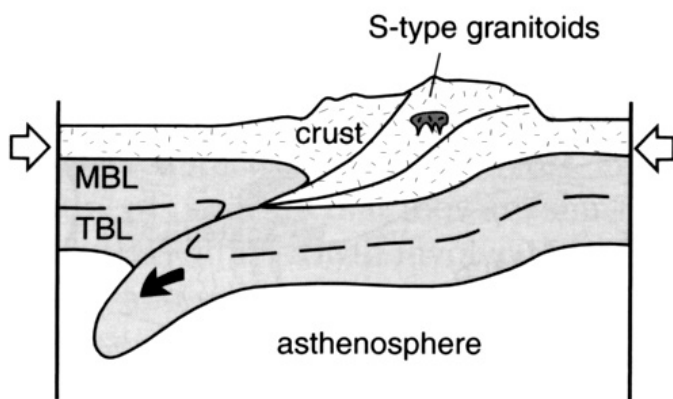


## S-I-A-M Classification

- Chappell and White
- S-type granites
- I-type granites
- A-type granitoids
- M-type granitoids

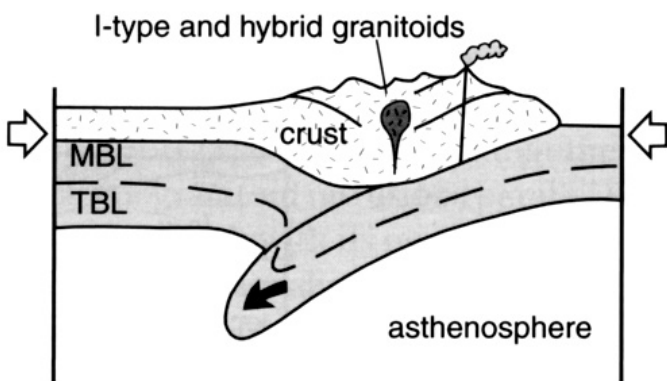
## S-Type Granites

- Occur in regional metamorphic terranes
- Partial melting of metasediments
- High Al but contain no hornblende
- Biotite, muscovite, cordierite, & garnet
- High Rb in source rocks
- Initial Sr ratios > 0.710



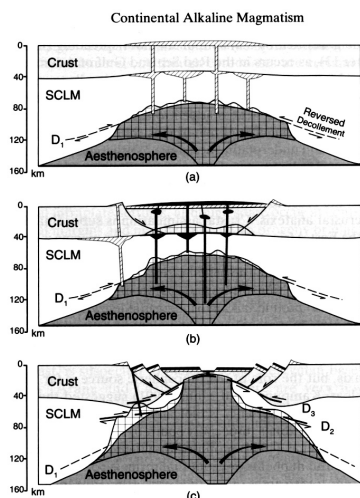
## I-Type Granites

- Subduction zone continental margin
- High Ca and Na
  - Contain hornblende and sphene
- Hornblende-rich inclusions
- Melting of deep crustal igneous rocks
- Source region poor in Rb
- Initial Sr isotope ratios < 0.708



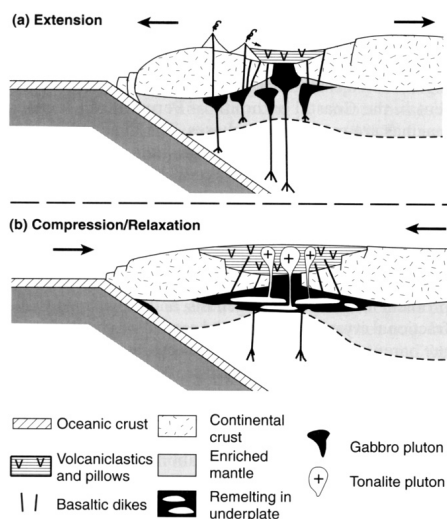
## A-Type Granitoids

- Anorogenic origin
- High in SiO<sub>2</sub>, up to 77%
- High alkalis, Fe/Mg, halogens
- Peralkaline?
- Stable craton environment



## M-Type Granitoids

- Originate as fractionated mantle melts
- Underplated mantle melts
  - May assimilate crustal materials
  - May mix with crustal melts
- Low Rb, Th, U
- Initial Sr ratios < 0.705
- Forms tonalites



## Time and Depth of Emplacement

- **Post-tectonic**
  - Cross cutting contacts
- **Syntectonic**
  - Concordant fabrics
- **Pretectonic**
  - Metamorphic imprint on fabric

	OROGENIC			TRANSITIONAL
	Oceanic island arc	Active continental margin	Continental collision	Post-orogenic uplift/collapse
= granitoid magma 				
<b>Examples</b>	Bougainville, Solomon Islands, Papua New Guinea	Mesozoic Cordilleran batholiths of west Americas Gander Terrane	Manaslu and Lhotse of Nepal, American Massif of Brittany	Late Caledonian Plutons of Britain, Basin and Range, late Variscan, early Northern Proterozoic
<b>Geo-chemistry</b>	Calc-alkaline > thol. M-type & I-M hybrid Metaluminous	Calc-alkaline I-type > S-type Met-Al to sl. Per-Al	Calc-alkaline S-type Peraluminous	Calc-alkaline I-type S-type (A-type) Metalum. to Peralum
<b>Rock types</b>	qtz-diorite in mature arcs	tonalite & granodior. > granite or gabbro	migmatites & leucogranite	bimodal granodiorite + diorite-gabbro

	TRANSITIONAL	ANOROGENIC	
	Post-orogenic uplift/collapse	Continental rifting, hot spot	Mid-ocean ridge, ocean islands
= granitoid magma 			
<b>Examples</b>	Late Caledonian Plutons of Britain, Basin and Range, late Variscan, early Northern Proterozoic	Nigerian ring complexes, Oslo rift, British Tertiary Igneous Province, Yellowstone hotspot	Oman and Troodos ophiolites; Iceland, Ascension, and Reunion Island intrusives
<b>Geo-chemistry</b>	Calc-alkaline I-type S-type (A-type) Metalum. to Peralum	Alkaline A-type Peralkaline	Tholeiitic M-type Metaluminous
<b>Rock types</b>	bimodal granodiorite + diorite-gabbro	Granite, syenite + diorite-gabbro.	Plagiogranite