Mechanism of emplacement of large magma chambers

Pluton formation

Propagation of magma at depth

Root lifting dominant process (E, 2015; Habert and De Saint-Blanquat, 2004; Johnson and Pollard, 1973; Pollard and Johnson, 1973) Mecha

Mechanism of magma emplacement-

Stoping-balloon-diapirism

Cooling

Laccolith-Emplacement

(Habert and De Saint-Blanquat, 2004)

* Time scale for laccolith formation ( by roof lifting, upward bending of the overlying strata). Henry mountains laccolith - Black Mesa bysmalith: more or less cylindrical structure. -Multi pulse pluton+ melted zone maintin with the pluton during ints construction.
* Abscence of metamorphism on the side - rapid emplacment - Maximum duration $60$ years - 4 m / year. Every 3 monts- pulse of magma 20 meters more consistent
* Bilan -
* Time scale for shallow magma reservoir - fast - from several monts to less than hundred of years.

(Morgan et al., 2005)

Study Henry mountain- laccolith-sill-bysmalith are three stages of the same process – Order- sill+laccolith and fracture at the border –piston like uplift with bysmalith.

(Horsman et al., 2005)

Look at the strtuture of Henry moutaint (field study ) sheeted laccolith

Fracture dynamics

(Murdoch, 2002)

{Bunger:2005ee}

hydrolic fracture

Influence of the local stress field

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TITRE : ???

Part I : High-level magmatic systems

1. Shallow intrusive magmatism on terrestrial planets
   * Magma transport
     + Mechanism of magma ascent
     + Mechanism for arrest
     + High level magmatic system
   * Shallow magmatic system on the Earth
     + Crust of the Earth
     + Laccolith from Corry et al
     + Laccolith at Elba Island
   * Shallow magmatic system on the Moon
     + Crust of the Moon
     + Low-slopes domes
     + Floor-fractured craters
2. Previous model for shallow magmatic intrusion
   * Original theoretical framework
   * Elastic-plated gravity current
     + Theoretical model
     + Regimes of propagations
     + Application to shallow magmatic intrusion on Earth and the Moon
     + Discussions
   * More realistic model for shallow magma emplacment
     + Cooling of the magma body
     + Influence of the topography
     + Thesis route map

Part II: Theoretical model of the cooling of elastic-plated gravity current and applications to laccolith on Earth and the Moon

* 1) Model for a cooling elastic-plated gravity current
  + Theoretical model
  + Numerical approach
* 2) First order modeling- Isothermal boundary conditions
* 3) Second order modeling- More realistic conditions

Part III: Theoretical model of elastic-plated gravity current under non-constant constrain: Application to floor-fractured craters on the Moon

1. A model for the dynamics of crater-centered intrusion: Application to the lunar floor-fractured craters
2. Gravitational signatures of lunar floor-fractured craters