



The relationship between plutons and magma chambers: it is complicated

Catherine Annen and Jon Blundy

University of Bristol, United Kingdom (catherine.annen@bristol.ac.uk)

The relationship between plutons and magma chambers is controversial. It is now widely accepted that igneous bodies are dynamic and grow incrementally by addition of successive magma batches. Depending on their thermal state, these bodies can be liquid and eruptible, partially molten, or solid. Numerical simulation shows that these different states coexist. Their respective proportions depend on the magma input rate and evolve with time as the body grows and crystallises. If the liquid part erupts, the proportion of volcanic to intrusive rocks for a given system depends on the magma body growth rate and on when the drainage of the magma chamber takes place in the magma body history.

The oldest zircons present in the eruptible magma are always younger than the age of the igneous body. So, the longevity of the magmatic system cannot be directly inferred from the volcanic zircon ages. Similarly, because a large part of the magma solidifies without erupting, magma input rates obtained by dividing the volume of erupted rocks by the spread of zircons ages do not necessarily correspond to the actual magma body recharge rate.

Simple numerical models reveal the inherent complexity of dynamic magma systems and go some way towards explaining why understanding the relationship between plutons and magma chambers remains a challenge.