The Making & Breaking of Cratons – Dr. Catherine Cooper

The first order observation of cratonic lithosphere is that it is there. While this might seem a bit of a flippant statement, the persistence of (most) cratonic lithosphere to survive and witness the majority of Earth’s history requires either possessing intrinsic properties that inhibit deformation, proximity to regions that preferentially experience more deformation, or a combination of the two. If we point to intrinsic properties providing craton stability, this can then winnow down the processes that led to the formation of thick, stable, cratonic lithosphere. However, just making stable lithosphere isn’t sufficient to meet that first order observation of being observable present day – (most) cratonic lithosphere is also long- lived, meaning that it must remain stable in changing dynamics. Making long-lived lithosphere (that can survive for billions of years) is more complicated than making thick lithosphere that is stable during past conditions. Often the conditions that allow for building cratonic lithosphere do not provide longevity, and, more problematic, the conditions required to make long-lived, thick cratonic lithosphere are not provided by the past dynamics. Thus, there is the potential for some cratons to not survive until present day. They, perhaps, weren’t built to last or their material properties modified post- formation, no longer ensuring stability. Regardless, understanding stability, longevity, and instability requires exploring the interplay between the intrinsic lithospheric properties - including its shape! - and mantle dynamics to determine when you make and you break cratons.