The Effect of External Factors on the Floating Mertz Glacier Tongue (East Antarctica) Prior to Its Calving

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This satellite-based study examines the dynamics and characteristics of the floating Mertz Glacier Tongue (MGT) in the decade prior to its calving in 2010, on a broad spatio-temporal scale. It shows that the tongue, the seaward extension of a major East Antarctic outlet glacier, has exhibited major and abrupt changes in flow and physical characteristics in response to previously under-appreciated external factors. These include contact of the northwestern tip of the advancing MGT with both the seabed and a small grounded iceberg. By lodging in a longitudinal rift, the latter “chiselled” approximately 40 square kilometres off the MGT over a 5-year period. A large-scale eastward deflection of the MGT flow trajectory due to the seabed contact coincided with rapid development of the western part of a major through-cutting rift system across the MGT, approximately 70-75km to the south, along which the vast iceberg C28 calved in 2010. Other important external factors identified include a collision with large iceberg C08 (calved from the Ninnis Glacier in 1980-82), and the perennial presence of an extensive slab of very thick land-fast sea ice attached to the eastern margin of the MGT. Mechanical coupling to this slab may have played a role in stabilising the MGT. We propose that such case-specific external factors represent key processes that affect ice tongue dynamics, and that understanding such processes is critical to assessing how glacier tongues calve.