# TERRASAR-X OBSERVATIONS OF THE RECOVERY GLACIER SYSTEM, ANTARCTICA

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We present a comparison of 1997 Radarsat Antarctic Mapping Project (RAMP) data with 2008-09 TerraSAR-X observations of the Recovery Glacier System in Coates Land Antarctica (Figure 1). The Recovery Glacier system was fully mapped for the first time in 1997 utilizing the then unique attribute of Radarsat to acquire C-band synthetic aperture radar (SAR) data extending to the South Pole. Through careful mapping of shear margins and flow stripes, the RAMP measurements revealed for the extent of these glaciers into the deep interior of East Antarctica. The northerly portion of the main trunk of Recovery Glacier and its confluence with several long but narrow tributary glaciers was also mapped interferometrically. Derived estimates of ice sheet surface velocity were used to calculate that about 31 $km^3$/a of ice are discharged into the Filchner Ice Shelf. The data were also used to examine the dynamical interaction between Recovery Glacier and its tributaries, where in one case it appears that the main trunk of Recovery Glaciers exerts a back pressure on the outward flow of the nearly orthogonally flowing tributary thereby decreasing its velocity by about 60-70 m/a near the junction. The Recovery Glacier system is of considerable scientific interest because of its role in discharging East Antarctic ice to the sea and because it has been subsequently learned that the flow of the glacier is likely controlled by the presence of subglacial lakes near the onset of faster glacier flow.

Eleven years later in 2008, the next high-resolution space-borne observations of Recovery Glacier were acquired using the TerraSAR-X satellite and as part of the International Polar Year. Again, we relied on the capability of TerraSAR-X to acquire X-band SAR data extending to high southerly latitudes and with very high spatial resolution. Along with obtaining image data, repeat pass data were acquired for SAR interferometry and high quality interferograms have now been created. Initial comparisons between the C- and X-band image data show that large scale patterns of crevasses, shear margins and glacier flow stripes are similar between 1997 and 2008. Consistency between the data sets and the clarity of features like crevasses in the TerraSAR-X data enabled us to identify the same crevasse patterns and individual crevasses in both the RAMP and TerraSAR-X data, at least in a few instances. By co-registering the two data sets using tie points, we applied manual feature retracking to estimate the 11-year average velocity of the ice. Our initial calculation suggests a slowing of the mid-portion of the glacier by about 50 m/a, but our errors are large because of uncertainties in selecting registration tie points. A definitive assessment of changing dynamics awaits further processing of the 2008 interferometric data which will also be used to extend the velocity measurements to the upper reaches of the glacier system.

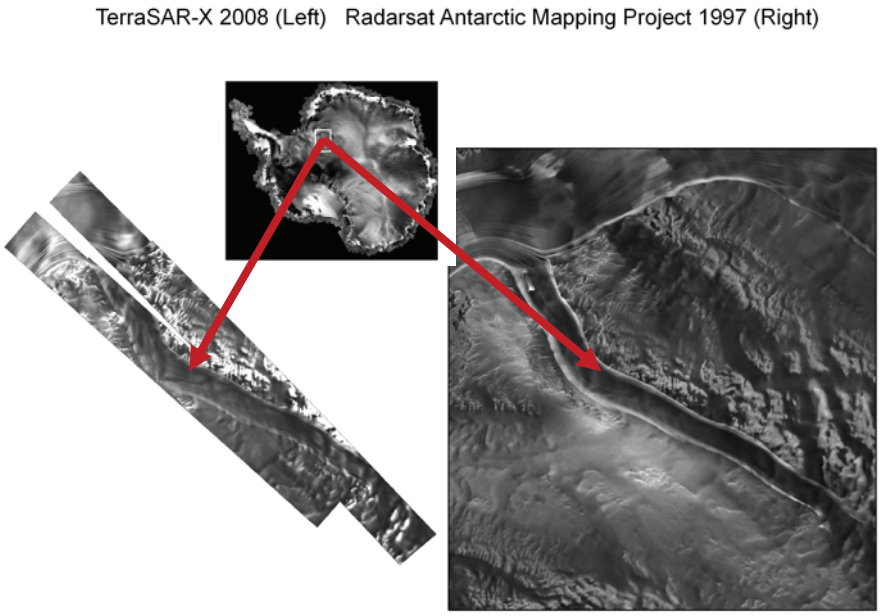


Figure 1. Early TerraSAR-X data (left) and RAMP data (right) of Recovery Glacier. Location is shown in the inset map.