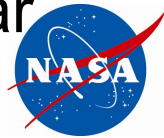




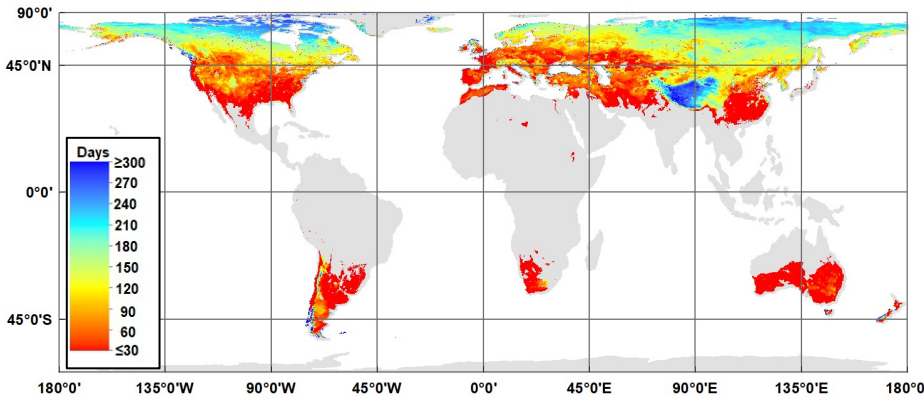
# SMAP Freeze/Thaw Data Record Explains Year-to-Year Variations in Net Land Carbon Source/Sink



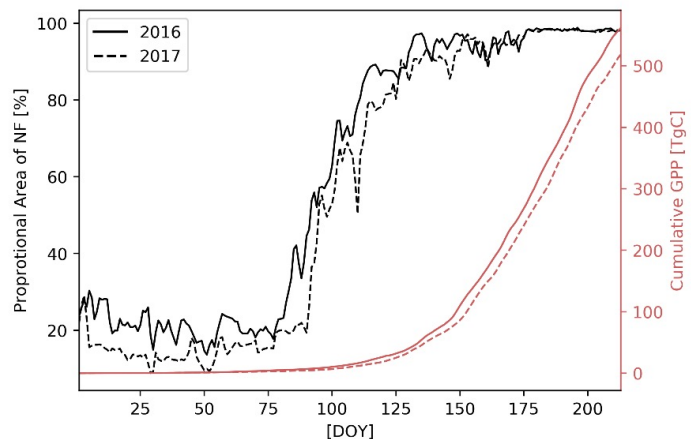
**Problem:** SMAP has enhanced L-band microwave sensitivity to freeze/thaw (FT) dynamics affecting ecosystem processes over ~51% (73 million km<sup>2</sup>) of the global land area. The latest (R16) SMAP FT product includes refined algorithms, longer record & larger domain than prior releases.

**Finding:** Mean annual FT accuracy of 78% (AM) & 90% (PM) meets or exceeds SMAP mission FT science requirements. Terrain complexity, open water & vegetation cover explain 29-53% of variation in FT accuracy.

**Impact:** New studies enabled for quantifying dynamic FT controls on global carbon-water-energy cycles and linkages.



2016 frozen season from L3FTP global product; areas outside of the FT domain shown in grey & white.



Spring progression of L3FTPE derived non-frozen (NF) area over Alaska in 2016 & 2017 relative to cumulative regional daily gross primary production (GPP) from the SMAP Level 4 Carbon (L4C) product; ENSO year 2016 had earlier spring onset & higher productivity than 2017.

Kim, Kimball, Xu, Dunbar, Colliander, Derksen, 2019: Global assessment of the SMAP freeze/thaw data record and regional applications for detecting spring onset and frost events. *Remote Sensing*.