**Problem:** The range of vegetation response to pulse-availability of moisture that drives water, energy and carbon exchanges between land and atmosphere is not known.

**Finding:** SMAP-based simultaneous estimates of soil and plant water storage dynamics show evidence of pulse-response behavior across more than half of global ecosystems.

**Impact:** Intermittency as well as mean resources availability drives land-atmosphere water, energy and carbon exchanges.

This study estimates plant wilting limit based on SMAP data and finds its relation to both soil texture and plant type.