

Airbus Perlan Project Mission II 2019 Season  
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The Airbus Perlan 2 research glider has recently returned from its 2019 campaign of using stratospheric waves and the polar vortex over the Southern Andes to reach record altitudes and collect scientific data. The Perlan Project is composed of a team of world-class scientists, engineers, pilots, and administrators working together to apply aerospace technology and atmospheric research to fly a glider higher than any unmanned aircraft has ever flown. The Perlan 2 currently holds several of the highest altitude records including the most recently attained record of 74,298 feet, set in September 2018. For the 2019 season, the Perlan set out to reach a record glider flight altitude of 90,000 feet. In addition to aeronautical advancement, the Perlan 2 also supports atmospheric scientific discovery by carrying an array of atmospheric instrumentation with the ability to measure temperature, ozone, UVA/UVB, atmospheric pressure, differential pressure, and wind speed, direction, and lift. The 2019 season was unique in that the southern polar region experienced an unprecedented sudden stratospheric warming event, which weakened the Perlan 2's ability to reach record altitudes. A sudden stratospheric warming event is considered to be occurring when there is a sudden warming of the polar stratosphere without any obvious external source. These events can warm the polar stratosphere by as much as 10 degrees Celsius per day within a week, reversing the normal north-south temperature gradient that the polar jet requires to maintain strength. The polar night jet is believed to be a key driver of tropospheric weather and climate patterns. SSW's are more common in the Northern Hemisphere as there is more land mass which allows the troposphere to interact more directly with the stratosphere. In the Southern Hemisphere the last known SSW took place in 2002. As the exact cause of SSW is unknown and there is a lack of meteorological observations in the Southern Hemisphere, the scientific community was fortunate to have the Perlan 2 in an active campaign on location during this event. The Perlan 2 has the capability to fly into the stratosphere and take direct measurements of temperature fluxes and changes in wind speed, wind direction, and ozone concentration that are directly related to SSW. Sudden stratospheric warmings are poorly resolved in climate and weather models but are believed to have a large effect on Southern Hemispheric climate-sensitive circulations, such as the polar vortex. Atmospheric measurements collected by the Perlan 2 glider can help to better resolve the causes and effects of sudden stratospheric warming and allow for weather and climate modelers to more accurately predict their occurrence and interactions with global and regional systems.