Seasonal evolution of estimated stratopause height and its distance to the cold point tropopause from COSMIC radio occultations

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A method is described to use COSMIC radio occultation (RO) bending angles as a function of impact parameter to identify the impact heights of cold point tropopause (CPT) and stratopause. The seasonal evolution of stratosphere impact height thickness can then be estimated from COSMIC radio occultation measurements. Since current temperature profile retrievals only reach up to ~40 km and RO refractivity is only retrieved up to ~ 50 km, the method uses bending angle which allows us to go higher (~65 km) and identify the change of lapse rate associated with the stratopause. A GCM-independent initialization of the hydrostatic integral is used to obtain the shape of temperature profiles and thus lapse rates to validate the heights at which large scale lapse rates change, as is expected at the stratopause and the CPT, and compare to the heights inferred from the bending angles.

After discussing the limitations, challenges and capabilities of the approach used, the method is applied to radio occultation profiles from 2011 to study variations with space/time/season in stratosphere thickness.