

2019 Southern Hemispheric SSW triggered Q6DW-Tide-GW interactions observed by meteor radars at 30°S

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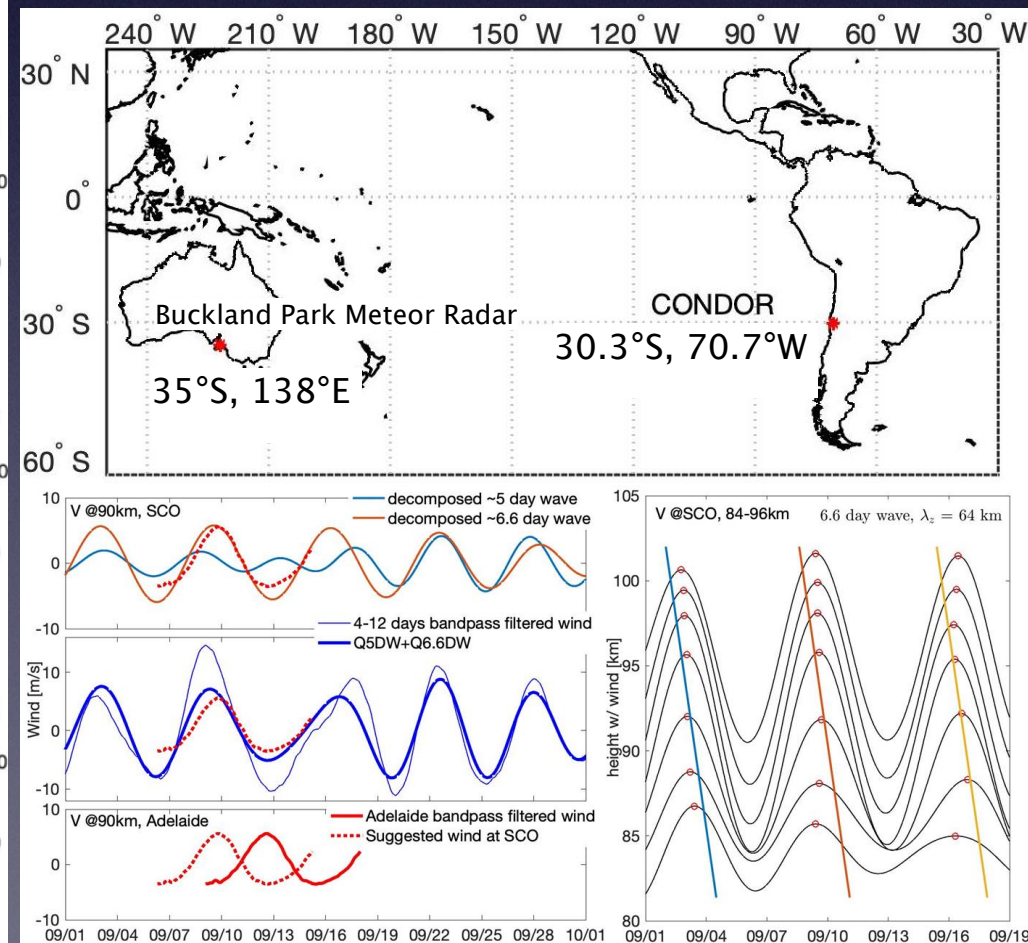
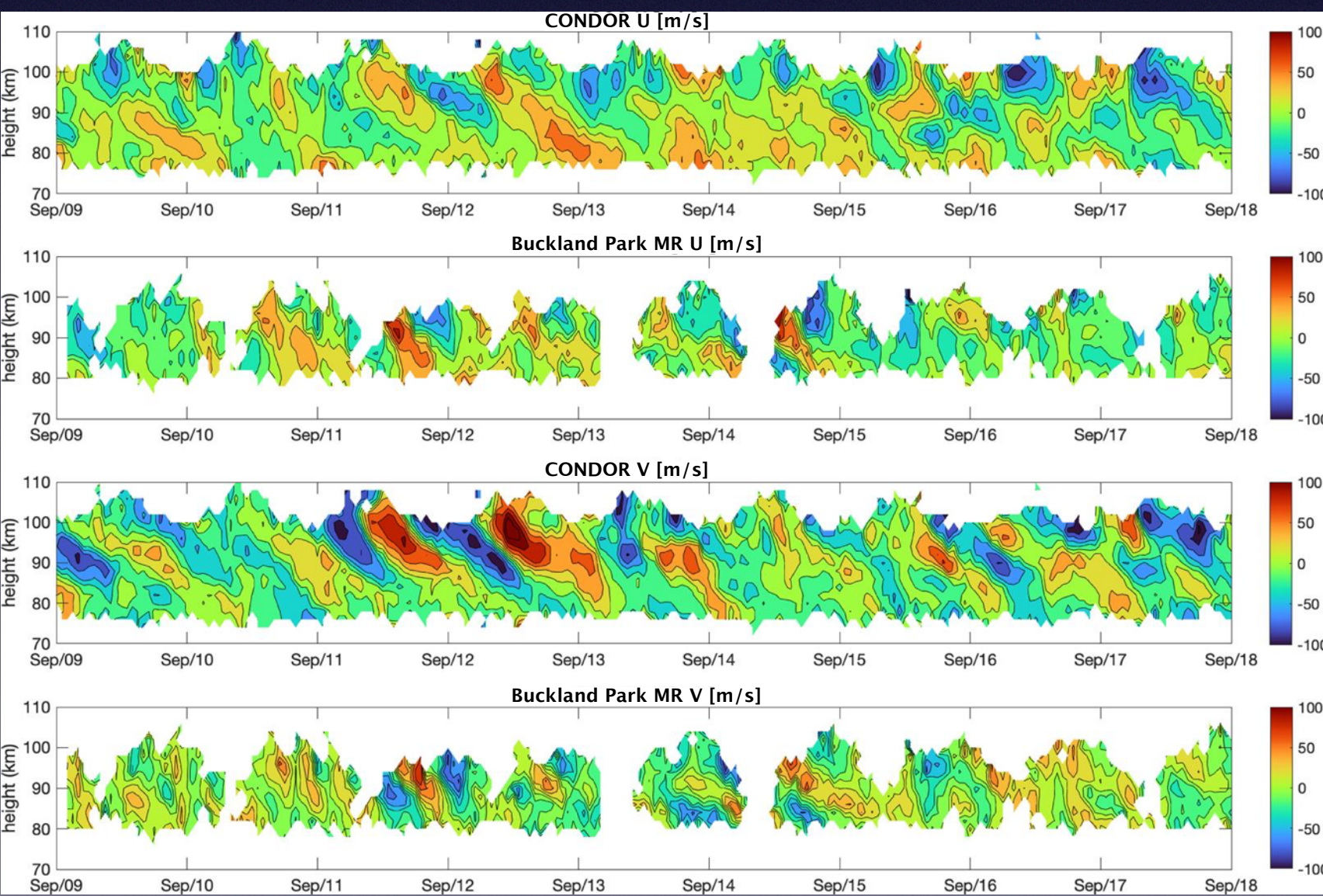
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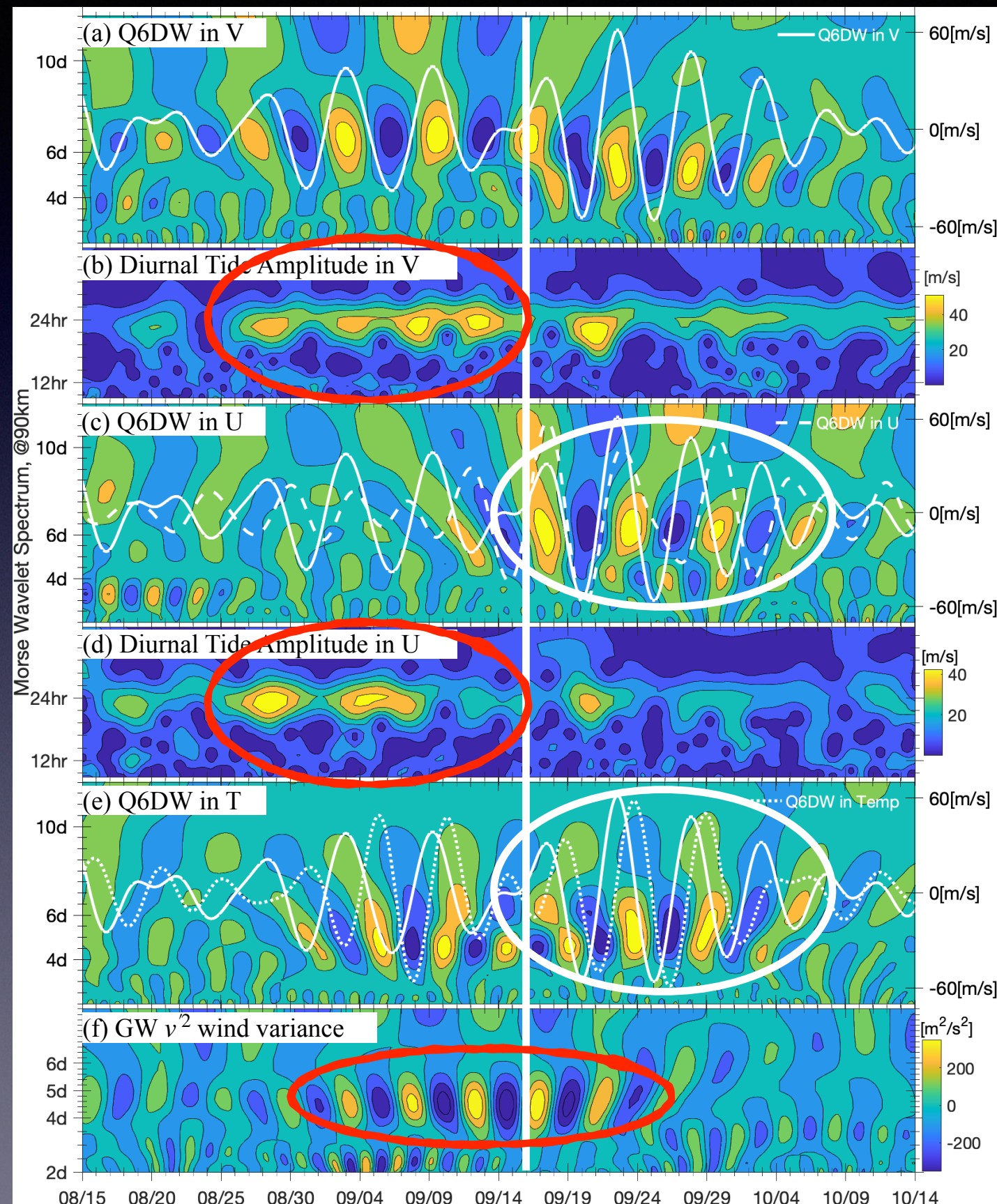
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Scientific Motivation

1. Southern hemispheric SSW is rare;
2. Q6DW are greater than the average in Sep. during 2019 SH SSW;
3. The strong Q6DW activity provides a good opportunity to study Q6DW-Tides-GWs interactions.

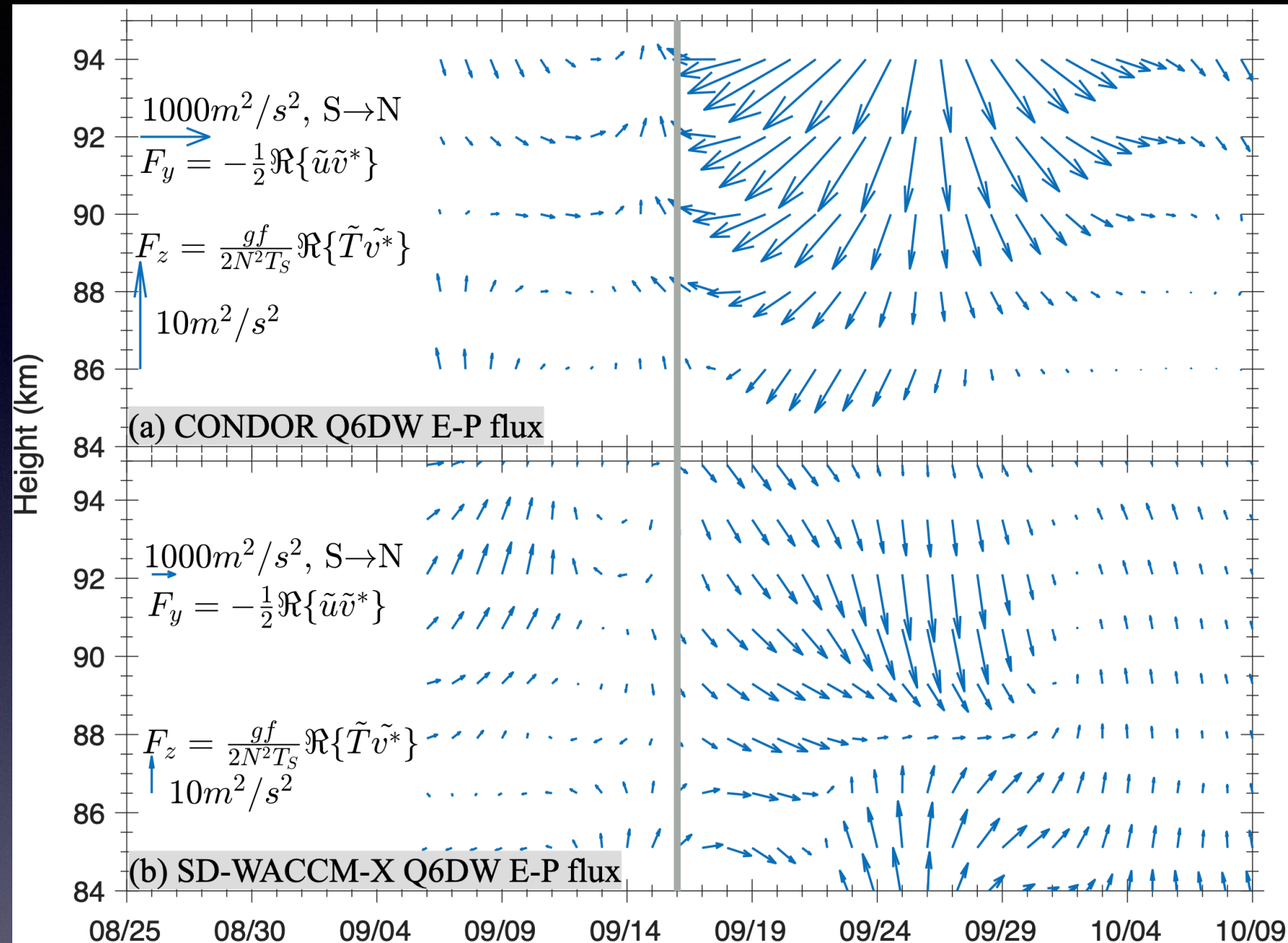


Result 1: GW meridional wind variance and diurnal tide amplitude show strong quasi-6-day periodicities



- ▶ **Diurnal tide** wavelet amplitude shows a strong 6-day periodicity in V (max ~60 [m/s])
- ▶ **Gravity waves variance** in meridional wind shows a substantial response to the 6 day wave activity
- ▶ In-phase U and V (dashed, solid) indicates this Q6DW has a varying *southward to northward flux* of the **westward momentum**
- ▶ V and T (solid, dotted) phase difference $< 90^\circ$ indicates a **equatorward eddy heat flux**

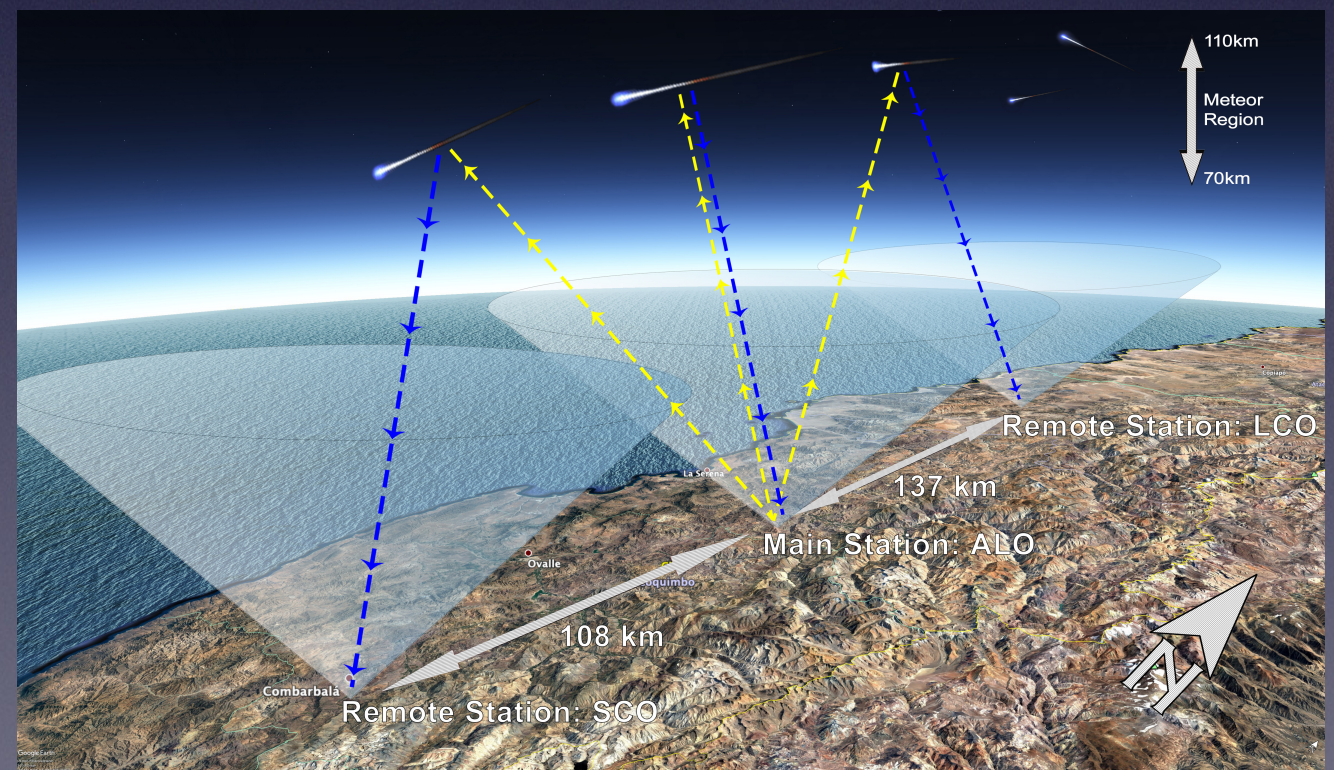
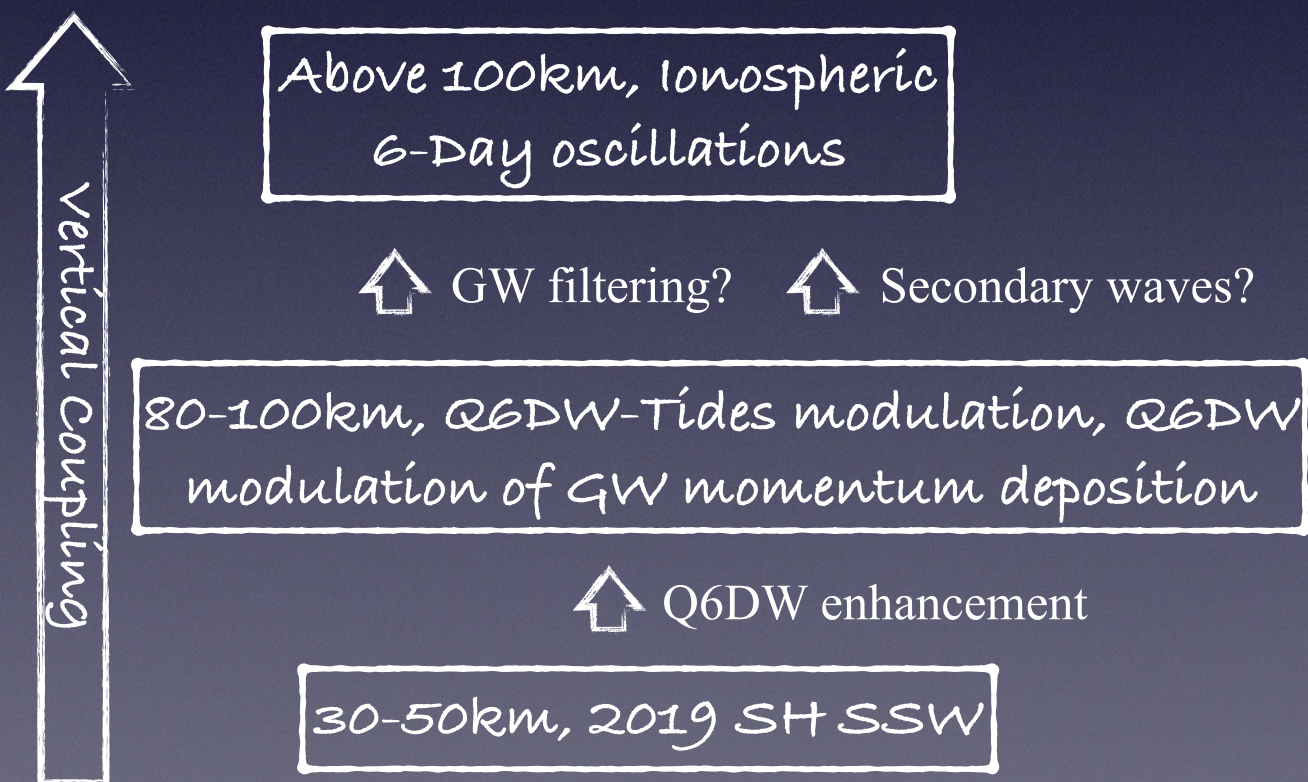
Result 2: Downward EPZ and time varying EPY indicated from Q6DW Eliassen-Palm flux



- Eliassen-Palm (E-P) flux ($\mathbf{F} = \hat{\mathbf{j}}F_y + \hat{\mathbf{k}}F_z$): $F_y = -\overline{u'_0v'_0} = -\frac{1}{2}\Re\{\tilde{u}\tilde{v}^*\}$, $F_z = \frac{gf}{N^2} \frac{\overline{\theta'_0v'_0}}{\theta_s} = \frac{gf}{N^2} \frac{\Re\{\tilde{\theta}\tilde{v}^*\}}{2\theta_s}$.
- First result of meteor radar observed Q6DW E-P flux exhibits a good agreement with simulation.
- Enhancement of the E-P flux suggests potential energy/momentum deposition in the background atmosphere.

Take-Away Messages

- ▶ A strong W1 Q6DW activity associated with the rare 2019 SH minor SSW is determined by two meteor radars at 30° S
- ▶ Both GW wind variance and diurnal tide amplitude indicate a strong, clear quasi-6-day periodicity in meridional wind
- ▶ First result of meteor radar observed Q6DW E-P flux is presented and exhibits a good agreement with SD-WACCM-X simulation, indicates equatorward heat flux and time varying momentum flux



To what extent do PWs penetrate above 100 km?