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Coherent structures observed immediately above Amazonian forest canopy in Rebio Jaru Reserve, Rondônia, Brazil

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Abstract: We used Morlet wavelet transform to detect coherent structures in wind velocity turbulent field above and within Amazon forest canopy. The data were measured in March 1999, during the wet-season of the Large Scale Biosphere Atmosphere Experiment in Amazonia (LBA), in southwestern part of Amazonia region. Measurements were made simultaneously at three different heights in a 60 meters micrometeorological tower located in the Biological Reserve of Jaru (10° 04' S, 61° 56' W), Brazil. The fast response wind speed measurements, sampled at 60 Hz rate, were made using Campbell three-dimensional sonic anemometers at the heights of 66 and 42 m (above the canopy), and 21 m (below the canopy). The results show that coherent structures are allways present at the 42m level, irrespectively of the time of the day. On the other hand, coherent structures are not ubiquitous in the wind velocity turbulent signal measured at 66 and 21 m. During the day, the time-scale associated with the coherent structures detected at 42 m is of the order of 30 to 40 s. During the night, this time-scale grows up to values between 90 and 100 s. We congecture that these coherent structures are "role-type" structures asociated with inflexion point instability. They have a time-scale of the same of order of magnitude, and defined as $t = 1 / (d u / dz) |_h$, where $du / dz |_h$ is the mean horizontal wind velocity vertical gradient at $h = 32$ m, the mean height of the forest canopy.

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