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The impact of severe dry season on net ecosystem exchange in the Neotropical rainforest of French Guiana

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The lack of information on the ways seasonal drought modifies the CO₂ exchange between Neotropical rainforest ecosystems and the atmosphere and the resulting carbon balance hinders our ability to precisely predict how these ecosystems will respond as global environmental changes force them to face increasingly contrasting conditions in the future. To address this issue, seasonal variations in daily net ecosystem productivity (NEPd) and two main components of this productivity, daily total ecosystem respiration (REd) and daily gross ecosystem productivity (GEPd), were estimated over 2 years at a flux tower site in French Guiana, South America (5°16'54" N; 52°54'44" W). We compared seasonal variations between wet and dry periods and between dry periods of contrasting levels of intensity (i.e. mild vs. severe) during equivalent 93-day periods. During the wet periods, the ecosystem was almost in balance with the atmosphere (storage of 9.0 gC.m⁻²). Seasonal dry periods, regardless of their severity, are associated with higher incident radiation and lower REd combined with reduced soil respiration associated with low soil water availability. During the mild dry period, as is normally the case in this region, the amount of carbon stored in the ecosystem was 32.7 gC m⁻². Severe drought conditions resulted in even lower REd, whereas the photosynthetic activity was only moderately reduced and no change in canopy structure was observed. Thus, the severe dry period was characterised by greater carbon storage (64.6 gC.m⁻²), emphasizing that environmental conditions such as during a severe drought modify the CO₂ exchange between Neotropical rainforest ecosystems and the atmosphere and potentially the resulting carbon balance.

Mots-clés : tropical, NEE, Reco, sécheresse, changement climatique