INTRODUCTION This work examines the atmospheric circulation anomalies associated with anomalous raingauge-based precipitation over the Eastern Amazon (EAM) and Northeast Brazil (NEB) on intraseasonal and submonthly timescales. It is attempted to isolate and identify the main rainfall-producing atmospheric mechanisms for these scales and regions. The analyses focus on the austral autumn (March to May) when the rainy season is deﬂagrated over the EAM/NEB. Two contrasting climatic scenarios deﬁned as UNFAV (simultaneous manifestations of the El Niño and the northward SST gradient in the intertropical Atlantic) and FAV (concomitant occurrence of the La Niña and the southward SST gradient in the intertropical Atlantic) are considered. UNFAV (FAV) composites for unﬁltered data showed changes in both the Walker and Hadley cells in association with the Atlantic ITCZ anomalously weakened (enhanced) that, in consequence, yields deﬁcient (abundant) rainy season over the EAM/NEB (Figs. 1, 2).

Composite Analyses based on events with anomalously increased precipitation (objectively selected from the PC series) on intraseasonal and submonthly scales are analyzed separately for the UNFAV and FAV years. These analyses showed that for both scenarios the more important rainfall-producing atmospheric mechanism over the EAM/NEB on intraseasonal scale consists in the establishment of deep convective bands triggered by South Atlantic Convergence Zone events or persistent frontal systems over the northeast Brazil. Such a regional pattern is embedded in a large-scale dynamical environment related to the propagation of the Madden-Julian Oscillation over the tropical South America (UNFAV-IS and FAV-IS composite maps in Figs. 4 and 6). On the other hand, the main rainfall-producing atmospheric mechanism over the EAM/NEB on submonthly scale is the Atlantic ITCZ during FAV years, while a weakened Atlantic ITCZ activity may be forced by meridionally elongated midlatitude wave trains at upper troposphere during UNFAV years (UNFAV-SM and FAV-SM composite maps in Figs. 5 and 7).

EOF Analyses The regional pluviometric variability over the EAM/NEB is objectively identiﬁed through EOF analyses performed on the (30-70 day) intraseasonal and submonthly (≤ 21 day) ﬁltered weekly precipitation anomalies for 18 autumn seasons (1983 to 2000). The principal components (PC) of the ﬁrst mode of each analysis show strong oscillations during the whole period. In particular, the oscillations observed during UNFAV and FAV years reveal that events with deﬁcient and abundant precipitation over the EAM/NEB occur alternately, even during years characterized by the extreme climatic conditions in both the tropical Paciﬁc and Atlantic Oceans (Fig. 3).

Fig. 1. Composites of (a) longitude-vertical cross-sections of the divergent circulation averaged between 5°S-5°N; (b) SST anomalies; (c) latitude-vertical cross-sections of the divergent circulation averaged between 55°W-35°W; (d) OLR anomalies for the UNFAV (panel on the left) and FAV (panel on the right) scenarios. Vectors in (a) and (c) are scaled according to the 5 m s⁻¹ (10⁴ hPa s⁻¹) vector at the bottom of each panel. Nonzero SST and OLR anomalies are contoured every 0.5 °C and 3 W m⁻² respectively with solid (dashed) contours for positive (negative) anomalies. Shading indicates areas with statistically signiﬁcant anomalies at the conﬁdence level of 95%.

Fig. 2. Composites of regional precipitation anomalies for (a) UNFAV and (b) FAV scenarios. Nonzero anomalies are contoured every 0.5 mm day⁻¹ with solid (dashed) contours for positive (negative) anomalies. Shading as in Fig. 1.

Fig. 3. Spatial patterns (top) and PC coefﬁcients (bottom) of the EOFI performed on intraseasonal (panel on the left) and submonthly (panel on the right) ﬁltered precipitation anomalies. Contour interval is 0.1 and statistically signiﬁcant absolute values greater than 0.5 are plotted. Dark (light) gray bars indicate UNFAV (FAV) years.

Fig. 4. UNFAV-IS (left panel) and UNFAV-SM (right panel) composites of regional precipitation anomalies. Nonzero precipitation anomalies are contoured every 0.5 mm day⁻¹ and 3 W m⁻², respectively. Shading as in Fig. 1.

Fig. 5. As in Fig. 4, but for the FAV-IS (left panel) and FAV-SM (right panel) composites.

Fig. 6. UNFAV-IS (left panel) and UNFAV-SM (right panel) composites of longitude-vertical cross-sections of the divergent anomalous circulation averaged between 5°S-5°N; (b) SST anomalies; (c) latitude-vertical cross-sections of the divergent anomalous circulation averaged between 55°W-35°W; (d) 200-hPa zonal wind anomalies. Vectors in (a) and (c) are scaled according to the 1 m s⁻¹ (10⁴ hPa s⁻¹) vector at the bottom of each panel. Nonzero SST and zonal wind anomalies are contoured every 0.2°C and 0.2 m² s⁻² respectively, with solid (dashed) contours for positive (negative) anomalies. Shading as in Fig. 1.

Fig. 7. As in Fig. 6, but for the FAV-IS (left panel) and FAV-SM (right panel) composites.