*Community reorganization change functional diversity facets*

Few studies have explored how moisture stress impacts the different functional diversity components (but see Hofhansl, Chacón‐Madrigal, Brännström, Dieckmann, & Franklin, 2021)⁠ despite the known importance of them for ecosystem functioning and resilience (Carmona et al., 2016)⁠. Here we explored, for the first time, the impact of reduced precipitation on Amazon functional diversity considering its three primary components: richness, evenness and divergence, and also examined functional diversity considering all the six chosen functional traits together.

The functional reorganization found in our results modified the three evaluated functional diversity facets both for single and multi-trait analysis, in accordance with hypothesis H3. But, as expected, because of the lower ability of PFTA to reorganize its functional diversity, alterations considering this approach were in a much lower degree when compared to TBA (Fig. XX). One of the main mechanisms that underly change on diversity facets in communities is the differential occupation of functional space driven by a disturbance (Boersma et al., 2016)⁠, such as moisture stress. The occupancy of distinct regions in functional space after disturbance can be caused by a change on the central tendency, occurrence, abundance and dominance relationship of trait values, as we observed in our results (Fig. XXXX).

In H3 we hypothesized that the stronger environmental filtering imposed by reduced precipitation would restrict functional traits values and combinations for those that could deal with the new conditions, leading to a smaller occupation of functional space, that is, a decrease in richness. This hypothesis has been supported for a variety of studies (Boersma et al., 2016; Mason, Mouillot, Lee, & Wilson, 2005; Swenson et al., 2012; Webb, Hoeting, Ames, Pyne, & LeRoy Poff, 2010)⁠. Nonetheless our results displayed a completely opposite tendency: the reduced precipitation increased the occupancy of functional space and richness in a great order of magnitude, both when looking into traits separately (Fig. XXX and Fig XX) and traits together (Fig. XXX). It might be explained by the paramount role that decrease in dominance exerted after the new precipitation scenario was applied, since it allowed new combinations of traits to establish or to increase their occurrence. These outcomes aggregate evidences that, in some cases, functional richness can increase in disturbance scenarios if the environmental change affects mainly the dominant strategies or trait values (Boersma et al., 2016; Funk et al., 2017; Mouillot et al., 2013).⁠

We also supposed in H3 that a more restrict selection of trait values would decrease evenness as the density of traits values would be less regularly distributed. But, also contrary to our expectations, the evenness exhibited an increase for all considered traits for the TBA. On the other hand, the PFTA showed a decrease in this functional diversity component for the majority of traits. The evenness increase in TBA is tightly related to the observed decrease of dominance and increase of abundance of trait values that were very rare before the disturbance. The decrease in evenness for PFT approach can be explained by the fact that the reduced precipitation decreased the dominance of a very restricted range of trait values (dominance of one PFT) and allowed the occurrence of the other 2 PFTs. Since the difference between the PFTs is very discretized, the occurrence of trait values ended up concentrated in three peaks of density hence turning the distribution less even. Evenness can also be interpreted as an evidence of the effectiveness in using the functional niche space⁠: the higher the evenness, the higher the utilization of the total functional space (De La Riva et al., 2017; Hillebrand et al., 2008; Mason, Mouillot, Lee, & Wilson, 2005; Mouillot et al., 2011)⁠. Therefore, our results indicate that a change in the environment can force the community to better occupy the functional niche space, contrary to our expectations in H3, providing, in that matter, lower sensibility to environmental changes, if it presents a sufficient variability in its trait values, as we observed for the TBA.

Lastly, the TBA presented a general decrease in divergence while the PFTA approach showed an increase for this functional diversity facet (in disagreement with our third hypothesis). The decrease in divergence found for TBA means that, regarding a specific trait, the distribution of values is no longer concentrated in the extremities of the functional space, but other trait values that were not that important before became significant for the community and for the ecosystem functioning with the environmental change. It also shows if the frequency distribution of trait values in the functional niche space maximizes the total community variation in functional characters (Mason et al., 2005)⁠. The increase in divergence found in the PFTA may be only a product of the emergence of the three peaks on traits distribution previously determined; for this approach an improvement in the occupation of functional space (low divergence) is impossible considering its very low diversity of trait values available.

Modifications in functional divergence indicates changes in the total abundance that is supported in a community by the plant life strategies with the most extreme functional traits, that is, that occupy the extremes of functional space (Mouillot, Graham, Villéger, Mason, & Bellwood, 2013; Villéger, Mason, & Mouillot, 2008)⁠. In that sense, a higher divergence means that the community is supported by more specialist strategies (Mouillot et al., 2013; Villéger, Miranda, Hernández, & Mouillot, 2010)⁠. Since we expected a more restrict occurrence of trait values, we also assumed that the occupation would be towards the extremities of functional space (H3), i.e., a higher degree of specialization in terms of trait values to deal with the imposed environmental change. However, contrary to our expectations the TBA presented a general decrease in divergence (Fig. XX). Based on an empirical evidence by analyzing a disturbance gradient, Mouillot et al. (2013) found a decrease in divergence the greater the disturbance, which was attributed to a declining abundance of the specialist species that were the most impacted by the disturbance. In TBA approach that seems the most plausible cause for the decrease in divergence since we also observed an expressive decrease in abundance of dominant trait values, which tended to concentrate at the extremes of functional spaces; as a consequence, other trait values that were not so expressive before became significant for the community. However, PFTA showed a general increase in divergence, that may be only a product of the emergence of the three peaks on traits distribution previously determined; for this approach an improvement in the occupation of functional space (low divergence) is impossible considering its very low diversity of trait values available. A lower divergence also indicates that the frequency distribution of trait values in the functional niche space maximizes the total community variation in functional characters (Mason et al., 2005), what can give a lower sensibility to disturbances (Villéger et al., 2010)⁠⁠, as has been shown by our results.