

COMPLEXITY AND REGULATION OF NITROGEN BIOCHEMICAL SYSTEMS

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Nitrogen is cycled throughout ecosystems by a suite of biogeochemical processes. These biogeochemical processes are inextricably entwined through alternative and specific biochemical reactions forming a highly complex biochemical system. Despite aggressive research, how the fundamental nitrogen biochemical processes are assembled and maintained in fluctuating soil redox conditions, remains elusive. We show that alternative biochemical pathways play a key role in keeping nitrogen conversion and conservation properties invariant in fluctuating environments. Our results indicate that the biochemical network holds inherent adaptive capacity to stabilize ammonium and nitrate availability, and that the bistability in the formation of ammonium is linked to the transient upregulation of the amo-hao mediated nitrification pathway. It is further shown how elevated anthropogenic pressure has the potential to break down the stability of the system, altering substantially ammonium and nitrate availability in the soil, with dramatic effects on biodiversity.

References

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