

Briefing paper

Environmental hydro-refugia demonstrated by vegetation vigour in the Okavango Delta, Botswana

Reynolds, S. C., Marston, C. G., Hassani, H., King, G. C. P., and Bennett, M. R. 2016. *Sci. Rep.* 6:35951.

For the first time, satellite remote imagery has been used to show how a rift basin, given suitable hydrogeology, can provide a buffer against the influence of climate on vegetation growth and thus provide a relatively stable living environment for animals amidst an otherwise arid, desert habitat.

Outline of research

The Okavango Delta, Botswana, is the world's largest wetland ecosystem and unique in its geological faulting, with a high biodiversity of flora and fauna amidst the Kalahari Desert. This study collated freely available Normalised Difference Vegetation Index (NDVI) imagery from a MODIS sensor in a time-series to map areas of plant growth associated with this wetland environment over 13 years. Using these data of vegetation growth and vigour inside and outside the Delta, harmonics analysis identified short-term deviations from longer-term seasonal recurring phenomena caused by events such as flooding or draughts, often resulting from climatic variability. It could be observed that these short-term deviations are suppressed inside the Delta, indicating long-term stability from the effects of climate variability on vegetation and providing a hydro-refugia even during dry seasons, and is in stark contrast to outside the Delta catchment area, which lies in the desert.

Key findings and impact

- The suppression of climatic variability means consistent levels of plant growth can be sustained, enabling animal populations to survive and thrive in the middle of a desert area.
- The buffering against climate provides the accommodation of an environment conducive to rich and diverse fauna and flora, with active tectonics facilitating wetland vegetation stability, through the action of the groundwater.
- The region is important and long-lived refugium for herbivores and at least one antelope species (grey rhebok) living in this wetland environment has become genetically distinct due to having been separated from other populations for long enough.

Conclusion

The identification of such environmental refugia is an essential component in understanding climate variability, considering the consequences of climate shifts for the environment. This study demonstrates the attraction of such basin areas to fauna, including human ancestors, in providing short-term climate refuge against environmental challenges, and their importance for studying the potential impact of future climate change on life in this area.



Read the full paper here:

www.nature.com/articles/srep35951