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## Oxygen-fire-vegetation feedbacks and the distribution of Earth's biomes

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Oxygen has varied in its abundance in the atmosphere throughout Earth's long-term evolutionary history. Laboratory experiments have shown that fire responds rapidly to oxygen changes. Therefore it has been suggested that increases and decreases in atmospheric oxygen levels have influenced fire frequency, fire behaviour and plant evolutionary adaptations to fire.

Recent research has indicated that periods with high atmospheric oxygen, such as the Cretaceous period, which also saw the evolution of new plant groups had the coupled effect of altering fire behaviour. Such modelled fire behaviour has been able to estimate that fires during this period would have been more intense and spread more rapidly which likely fed back to changes in ecosystem dominance. However, we are lacking understanding of how oxygen driven changes in fire might feedback to influence the dominance and distribution of land-surface vegetation cover across Earth's surface throughout Earth history.

Here I will present, a series of oxygen-fire-land cover simulations using the LPJ-LMfire Dynamic Global Vegetation Model that considers how oxygen-mediated changes in fire frequency and behaviour lead to changes in dominance of selected plant functional types within Earth's biomes and influence the total land area covered by forest.

Our aim being to explore the coupled influence of oxygen and a climate on vegetation distributions mediated by fire throughout Earth's past such that we can work towards understanding the balance of natural fire feedbacks to the Earth system versus human interrupted fire feedbacks in our modern day.