In plain words

In the last few decades a major scientific revolution has occurred in our understanding of the connectedness of the earth's biology, chemistry and physics. For instance, 40 years ago a meteorologist would have taken little or no notice of the role of vegetation in making a weather forecast, nor would soils have been regarded as a critical component of the climate system.

We now realize that, through the carbon cycle and through energy balance interactions, the earth's climate system is closely coupled to vegetation and soil processes. A shift in vegetation from forest to cropland changes the albedo (reflectance) and the energy balance of the earth's surface, has impacts on cloud formation and atmospheric humidity, and alters the exchange of greenhouse gases with the atmosphere. These are complex feedbacks between biota and environment that we struggle to understand and predict.

I am fascinated by these ecosystem-climate interactions, and they form the focus of my research. The world's climate is changing, and research is required to understand how ecosystems will respond, and how in turn these responses may accelerate or slow climate change. The topic is challenging because of the many scales and processes involved, but this also makes it exciting. Much of our understanding comes from detailed experiments at a few field sites, where plant growth, soil decomposition, local hydrology and meteorology can be investigated together.

But how can this local information provide insights at regional and global scales? These are the scales at which climate interactions can occur, and of interest to the wider public and policy makers. There are new technologies that are helping. For instance, satellites provide data across the globe on a range of indicators, such as vegetation cover and

soil moisture. Simulation models of ecosystem processes encapsulate our understanding and can be used to upscale knowledge from field site to globe, linked to satellite information.

Research on how ecosystem processes will respond to climate change, and other human impacts such as deforestation, is of clear societal importance. International agreements and UK policy are focused on avoiding dangerous climate change and on adapting to expected changes.

We rely on ecosystems for a range of services that maintain human well-being. Ecosystems provide us with critical resources (food, timber, fuel, purified water) and have aesthetic and cultural value. Understanding and predicting the effects of climate change on the delivery of these ecosystem services is a critical outcome of my research.