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An event calculus for reasoning about land use change using big Earth observation data sets

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This work introduces an event-based calculus for reasoning about land use change events, obtained by big Earth observation data analysis. The main contribution of the work is to use the concept of events to reason about land use change and to show how these events can be extracted from big Earth observation. The work argues that working with environmental change calls for different approaches than those used in location-based applications. We consider that humans change the landforms in stages. Farmers may clear a forest for cattle raising and then convert the land for crop production. In this view, land use change is best modelled as a sequence of occurrences with known duration. A land use event is taken to be a closed interval whose land cover is constant. Based on this view, the paper puts forward the land use change calculus by extending Allen's interval temporal logic to the spatial context. The calculus allows reasoning about events by comparing their temporal occurrences. Organising the changes as a sequence of events allows scientists to discover which land use transitions have taken place in large data sets. We introduce new predicates that express cases of recurrence, conversion and evolution in land use change. The calculus allows users to build complex expressions that describe how humans modify Earth's terrestrial surface. In this way, scientists can better understand the environmental and economic effects of land use change.

Events. Spatiotemporal. Event calculus. Big Earth observation data. Land use change.