

## research highlights

### OIL PRODUCTION

#### Impact of age

*Nat. Clim. Change* **7**, 551–556 (2017)

While the largest source of greenhouse gas emissions associated with oil usage is usually the combustion of the final fuel product, emissions from the extraction of the crude oil can also be significant. However, estimates of emissions typically rely on data that do not take into account engineering practices (such as oil recovery methods) and process requirements (such as fluid separation) that change with the age of the oilfield. Mohammad Masnadi and Adam Brandt at Stanford University fill this gap by using time-series data connected to these factors, along with production rate and parameters linked to other oilfield characteristics, to model the greenhouse gas emissions related to the production of oil at 25 giant oilfields across the globe as a function of age.

The oilfields studied by the researchers — although small in number — represent a large fraction of global oil production, with each having an estimated ultimate recovery over their lifetime of at least one billion barrels. While oil production tends to decrease with time at a given oilfield, the researchers find that average greenhouse gas emissions intensity approximately doubles over a 25 year period and that at certain sites there is a tenfold increase in emissions per megajoule of crude oil provided to the refinery. The increase in emissions with age is due, in part, to drops in reservoir pressure that mean that more energy-intensive recovery methods must be employed and more fluids associated with extraction per unit of oil must be processed. The results suggest that the variations in carbon emissions intensity of oilfields over their production life, rather than one-off measures, should be considered when designing and deploying future regulatory frameworks for emissions mitigation.

*James Gallagher*