### Health impact of air pollution linked to the oil and gas lifecycle in Texas



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# We focus on the major streams of the oil and gas (O&G) lifecycle



Processed NEI2017 datasets provided by Brian McDonald, NOAA

Texas O&G lifecycle contributes to 84% of NO<sub>x</sub>, 97% of NMVOCs and 16% of primary PM<sub>2.5</sub> emissions

#### **Baseline pollutant concentrations for Texas in 2017**

We use GEOS-Chem v13.0.0 to simulate pollutant concentrations Nested simulation over Texas at grid resolution 0.25°×0.3125°



Population-weighted  $PM_{2.5}$  and  $NO_2$  are higher than area mean because higher values of these are in populated areas

# **Ongoing validation of GEOS-Chem simulated pollutant concentrations**



The model replicates the variance in surface  $NO_2$  and  $O_3$ 



# **PM<sub>2.5</sub>** from oil and gas lifecycle for Texas in 2017

We run sensitivity simulations to assess the impact of each step in the oil and gas lifecycle



Oil and gas activities in Texas contribute to 0.78  $\mu$ g m<sup>-3</sup> (10.6%) of PM<sub>2.5</sub>, mostly (0.57  $\mu$ g m<sup>-3</sup>) from end use

# NO<sub>2</sub> from oil and gas lifecycle for Texas in 2017

Upstream activities in the Permian, Eagle Ford and Haynesville basins



Oil and gas activities in Texas contribute to 1.41 ppbv (62%) of NO<sub>2</sub>, mostly from combined upstream and midstream (0.37 ppbv) activities and from end use (0.99 ppbv)

### Ozone from oil and gas lifecycle for Texas in 2017

Decline in ozone occurs at NO<sub>2</sub> hotspots in Texas



Urban population exposure to ozone decreases and this will lead to some health benefits

## Premature mortality from the oil and gas lifecycle in Texas

Adult premature deaths estimated using the health risk assessment model from Vodonos et al. (2018) (>14 years old) Population from WorldPop and baseline mortality rates from CDC Wonder

#### **O&G Downstream O&G End-use O&G Upstream + Midstream** Premature deaths 50 40 30 20 10 3,450±0.7% **330**±2.3% **440**+2.0%

**4,220** premature deaths from the oil and gas emissions (**82%** from end-use, **10%** from downstream and **8%** from upstream activities)

#### Impact of Texas oil and gas emissions on surrounding areas

Oklahoma

Missouri

Kansas

Illinois

128

119

102

We run global simulations at grid resolution 2.0°×2.5° to assess the impact on neighbouring states and countries



Premature deaths linked to  $PM_{2.5}$  exposure from the oil and gas lifecycle

483

Any questions? Please contact Karn (<u>k.vohra@ucl.ac.uk</u>) <u>(</u>@kohra\_thefog