



Fuel oxygenate effects on catalyst heating operation in a diesel engine

During the first minutes after a cold start, diesel engines are operated with late post injections to generate hot exhaust that rapidly heats up aftertreatment systems. This project builds understanding of how oxygenate blendstocks affect mixture formation, combustion, and pollutant formation during catalyst heating operation.

Ethers and higher alcohols reduce UHC emissions, but they may not promote ignition of late post injections

C

Cetane number
of neat
compoundCN for 20 vol%
blended with
cert diesel (est.)

Dibutyl ether (DBE)

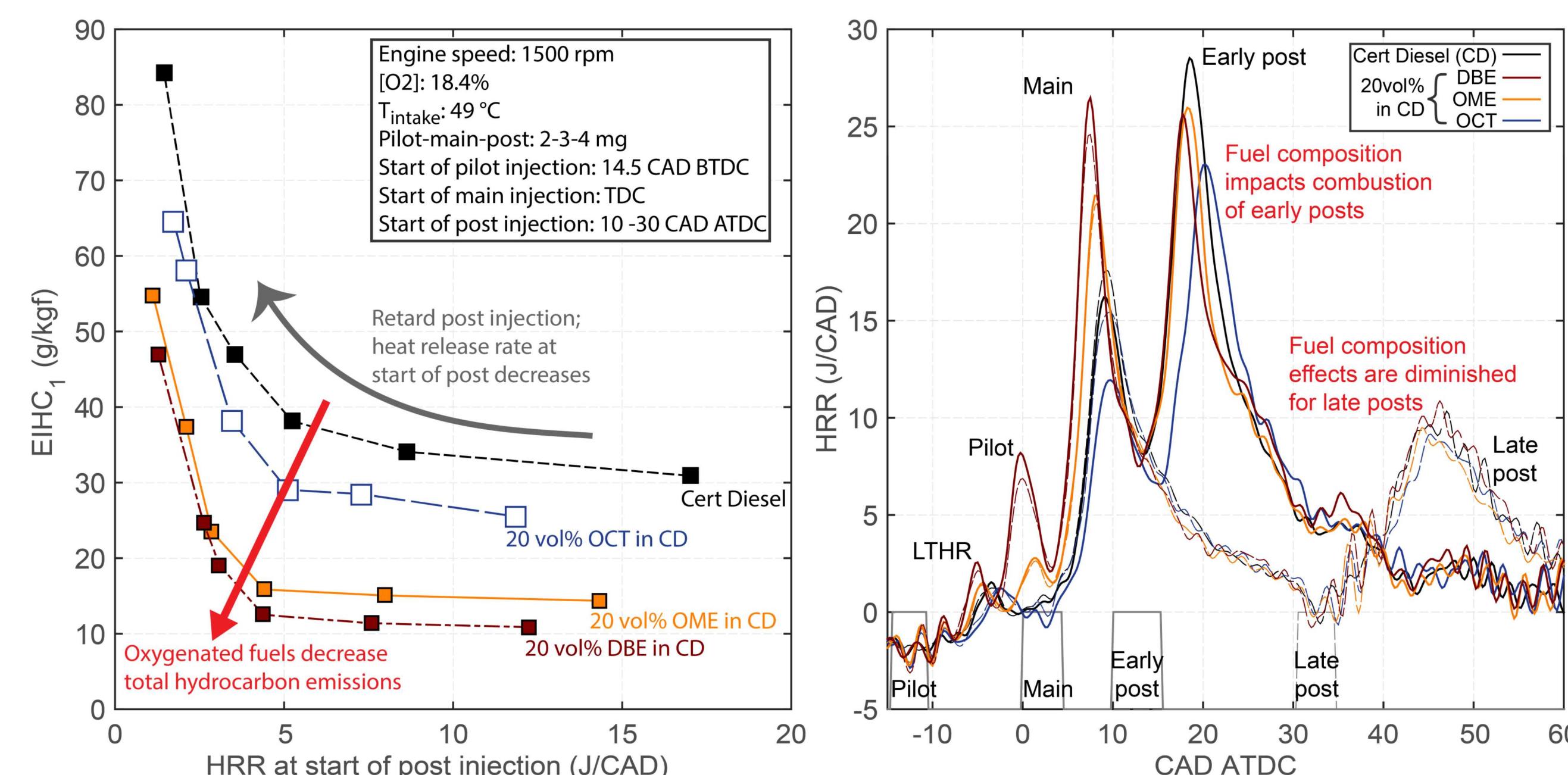
CCCOCC 56.1Polyoxymethylene
dimethyl ethers (OME)CC(C)(C)OCC[O]C(C)C 50.6

OME blend: n≈3-5

1-octanol (OCT)

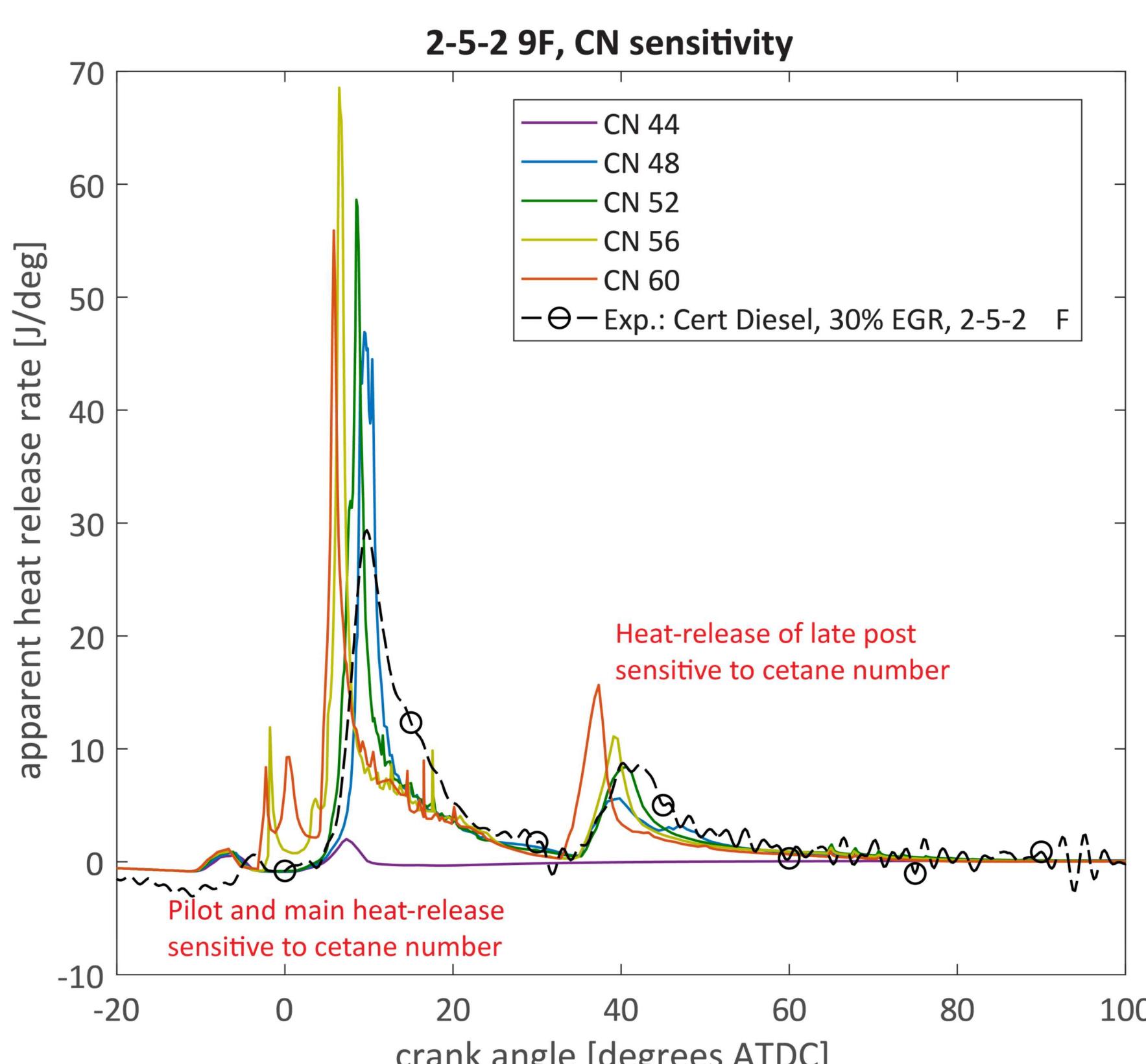
CCCCCCCCCO 42.5

Cert diesel: 43.9

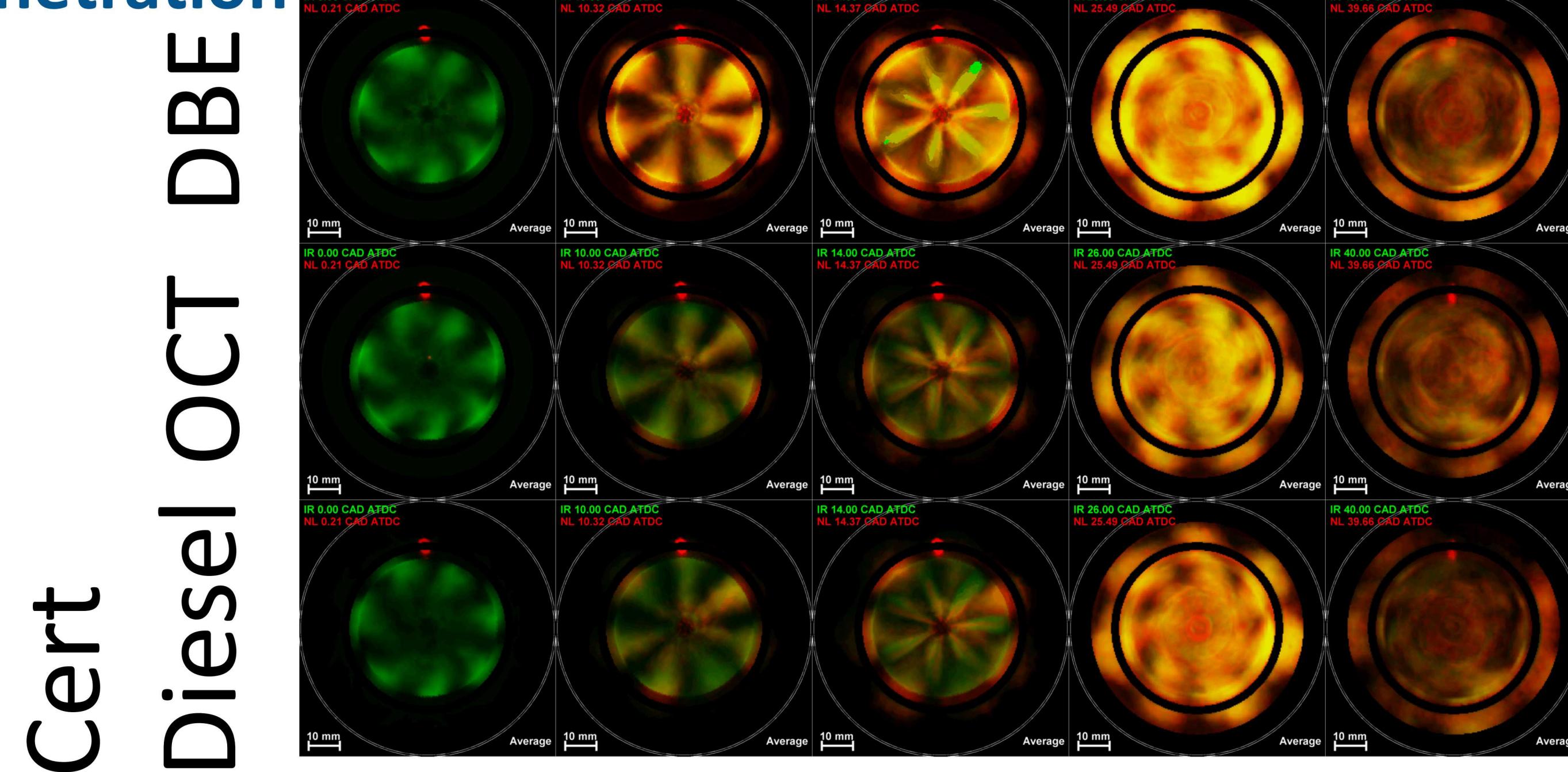


Initial simulation results don't match experimental data

- CFD simulations predict cetane sensitivity of late post injection combustion
- Future work will focus on resolving these discrepancies on a new metal engine

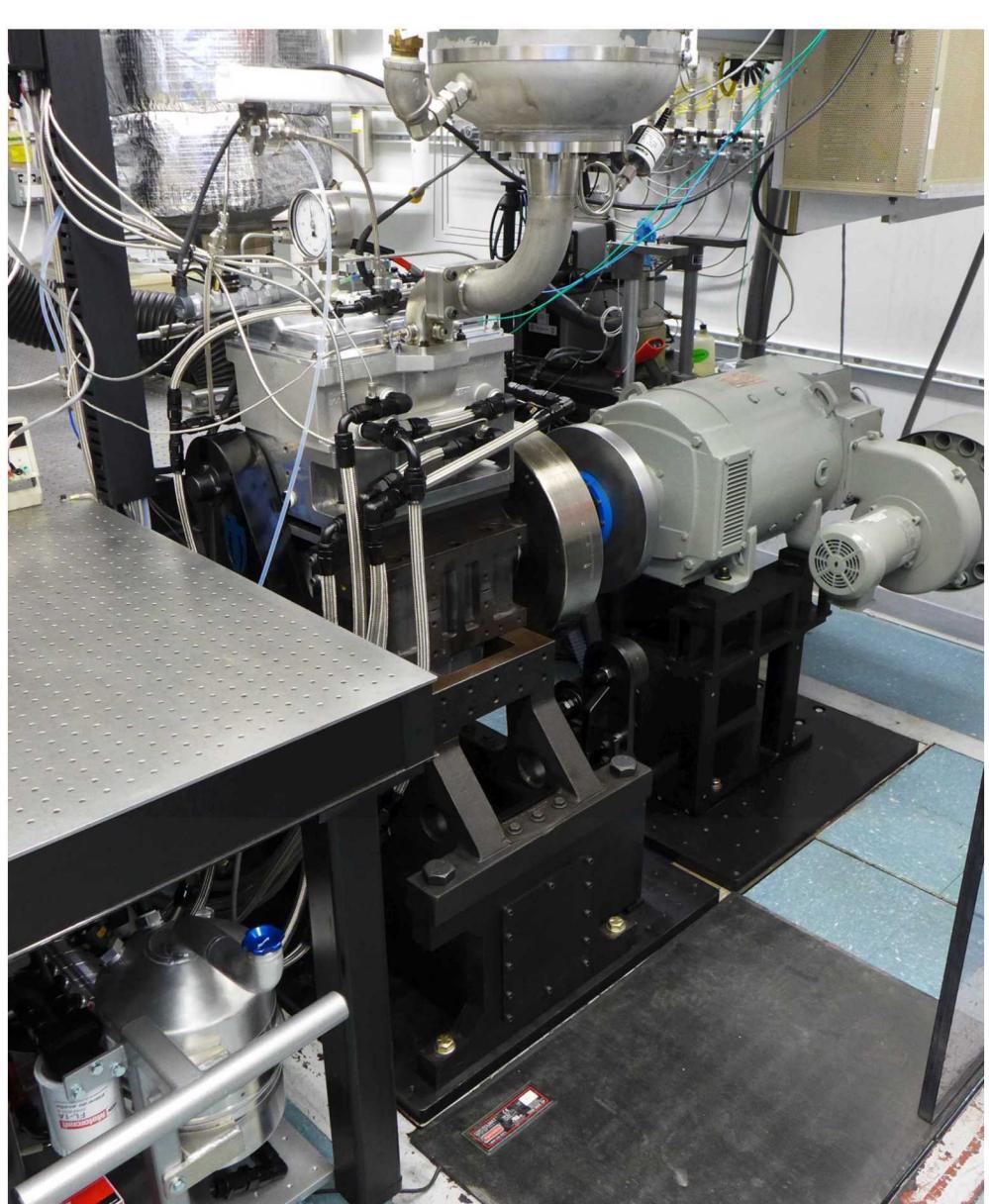


Ethers enhance combustion of the main injection and promote squish region penetration



Sandia's new medium-duty diesel research engine

Bore	99 mm
Stroke	108 mm
Compression ratio	16.2:1
Valves/cylinder	4
Injector	8-hole piezo
Piston bowl shape	Stepped-lip
Max speed	2000 rpm
Max rail pressure	2000 bar
Lubrication system	Dry sump



Ford Motor Company is gratefully acknowledged for their support of this new engine