

The role of international transportation sectors in climate stabilization

H. Preston, D. S. Lee, V. Eyring*, L. Lim

Manchester Metropolitan University, UK;* Deutsches Zentrum
für Luft- und Raumfahrt (DLR), Germany

^{&beyond}
4degrees, Oxford 28th – 30th September, 2009

Introduction

- 4 degrees? Current projections based on SRES-type assumptions; no climate policy envisaged
- Projected growth reflects expectations of aviation and shipping industries → a 4 degree world?
- What is the impact of these industries with their current growth expectations in a 2 degree world?

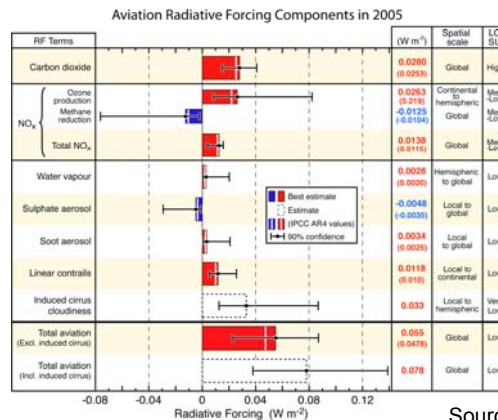
Aviation and shipping – related sectors

- Strong historical and projected future growth
- International emissions not covered by the Kyoto Protocol
- Dealt with by their own specialist UN Agencies (ICAO, IMO).
- Have complex non-CO₂ effects on the atmosphere...

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Radiative effects of aviation (2005)

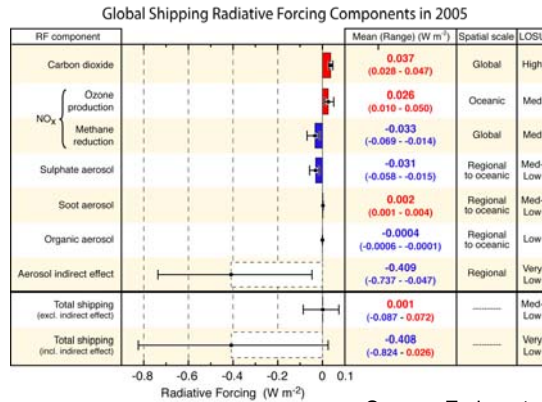


Source: Lee et al., 2009

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Radiative effects of shipping (2005)



Source: Eyring et al., 2009

Stabilization

Stabilization concept

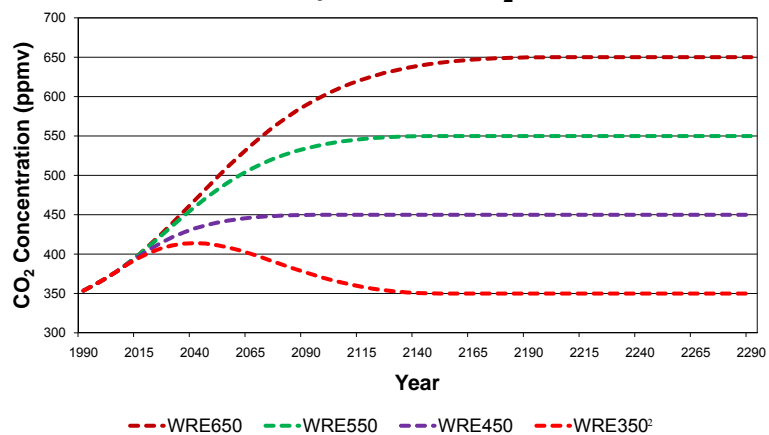
- Ultimate goal of the UNFCCC:
“stabilization of greenhouse-gas concentrations...at a level that would prevent dangerous anthropogenic interferences with the climate system”
- Stabilization requires an eventual and sustained reduction of emissions to subsequently below current levels.
- What will this reduction in emissions mean and where will they come from?

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WRE¹ stabilization profiles for CO₂ concentration



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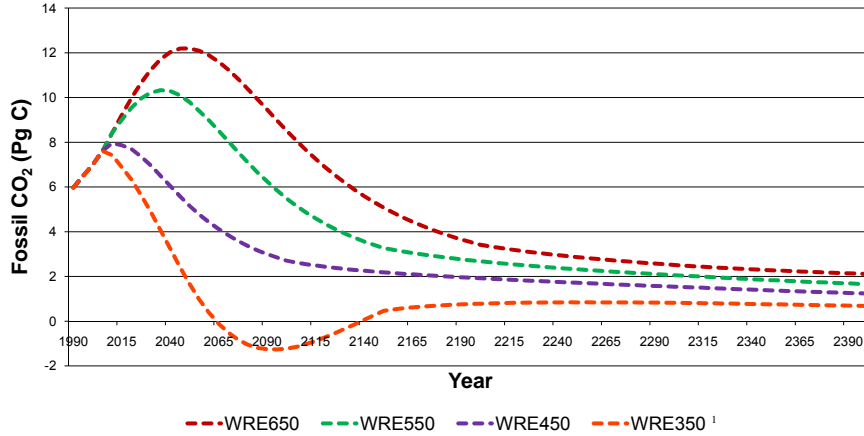
¹Wigley, Richels & Edmonds

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² CO₂ concentration data from MAGICC v.5.3

WRE stabilization profiles: emissions response



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¹ WRE data run through MAGICC v.5.3

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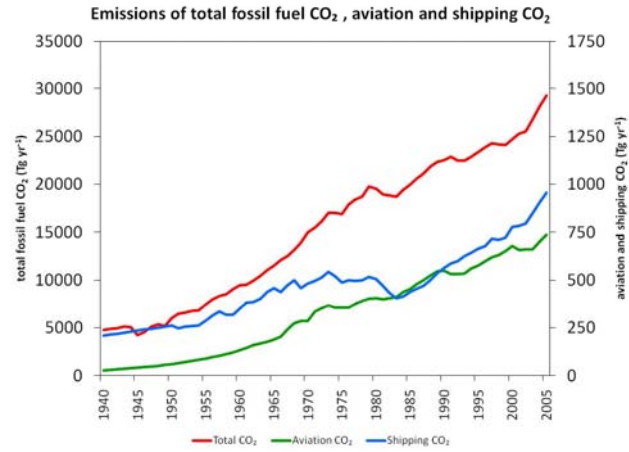
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Historical trends – aviation and shipping

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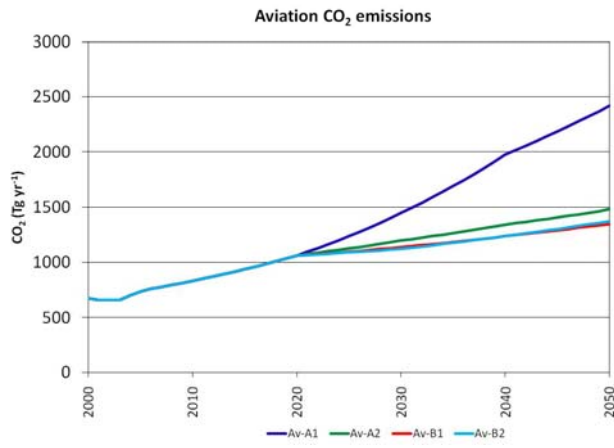
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Future scenarios – aviation and shipping

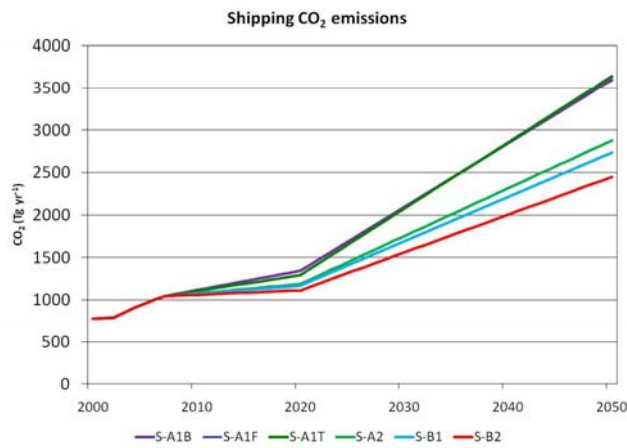
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Source: Owen et al. (submitted)



Source: Buhaug et al., 2009

Modelling methodology

Simplified climate modelling

- MAGICC background CO₂ concentrations
- LinClim* simple C-cycle model → marginal (sectoral) CO₂ concentrations
- IPCC RF function
- Temperature response (parent GCM, ECHAM/OPYC) → marginal ΔT

*Lim et al., 2009

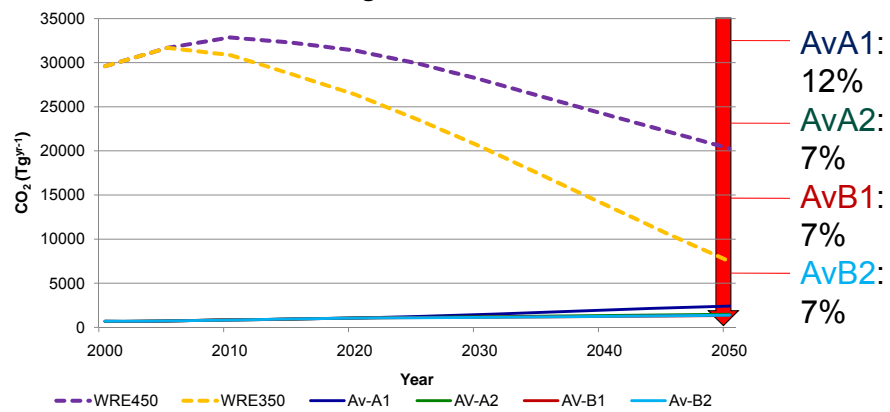
Results

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- Share of historical emissions to 2000: 2.1%

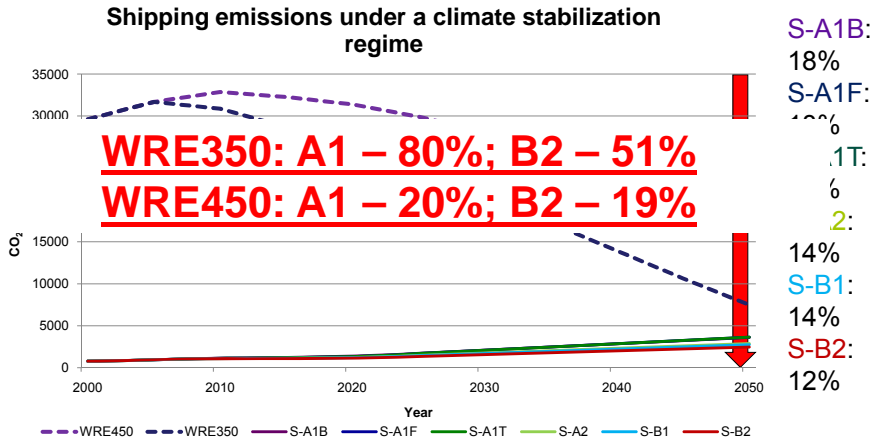
Aviation emissions under a climate stabilization regime



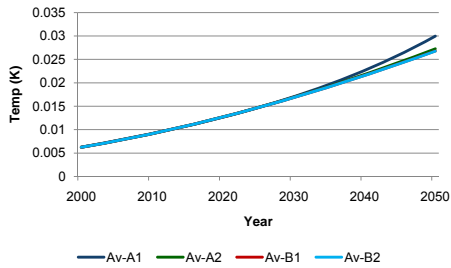
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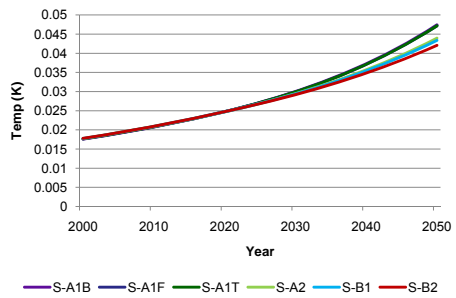
- Share of historical emissions to 2000: 3.6%



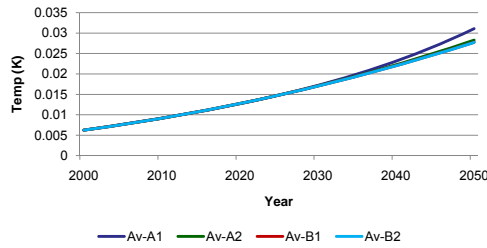
Temperature response from aviation emissions under a 450ppm stabilization regime



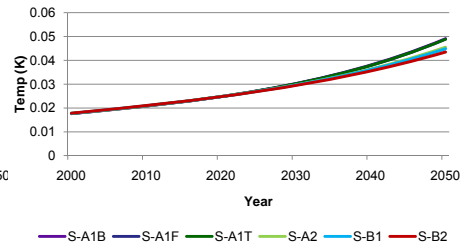
Temperature response from shipping emissions under a 450ppm stabilization regime



**Temperature response of aviation
emissions under a 350ppm
stabilization regime**



**Temperature response from
shipping emissions under a
350ppm stabilization regime**



Conclusions

- A first look at how aviation and shipping may or may not be compatible with stabilization.
- Important to provide a view to feedback possible future expectations to the sector.

Where next?

1. Look at the whole transport sector under stabilization
2. How are we to break down climate stabilization to allocation levels?

Thank you for your attention!

h.preston@mmu.ac.uk