

A photograph of a massive ice shelf in Antarctica, showing a large ice cliff and a smaller ice shelf in the foreground. The sky is blue with some clouds.

Reassessment of the potential sea-level rise from a collapse of the West Antarctic Ice Sheet*

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Complete collapse =>

- **5-7 m eustatic* SLR?**

*(here eustatic refers to the mean change in ocean mass)

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West Antarctic ice sheet and CO₂ greenhouse effect: a threat of disaster

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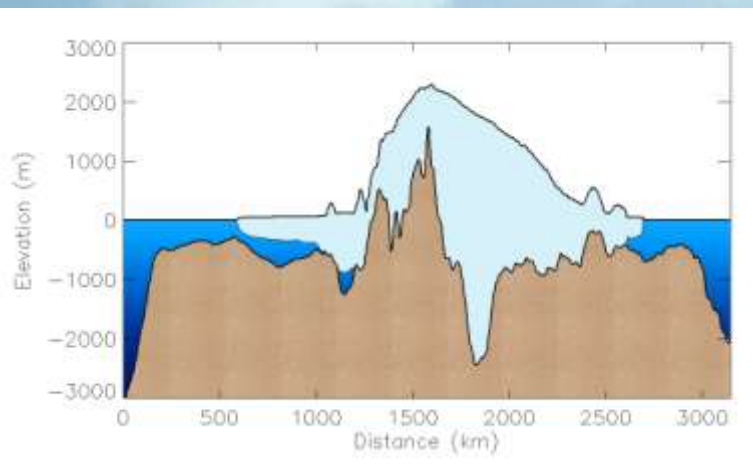
If the global consumption of fossil fuels continues to grow at its present rate, atmospheric CO₂ content will double in about 50 years. Climatic models suggest that the resultant greenhouse-warming effect will be greatly magnified in high latitudes. The computed temperature rise at lat 80° S could start rapid deglaciation of West Antarctica, leading to a 5 m rise in sea level.

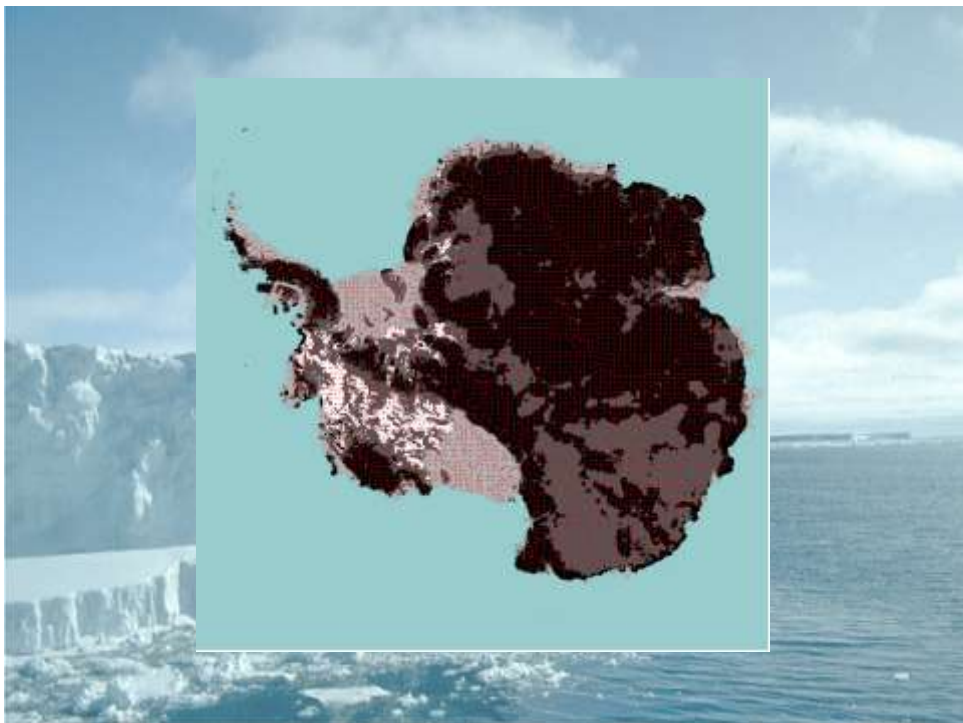
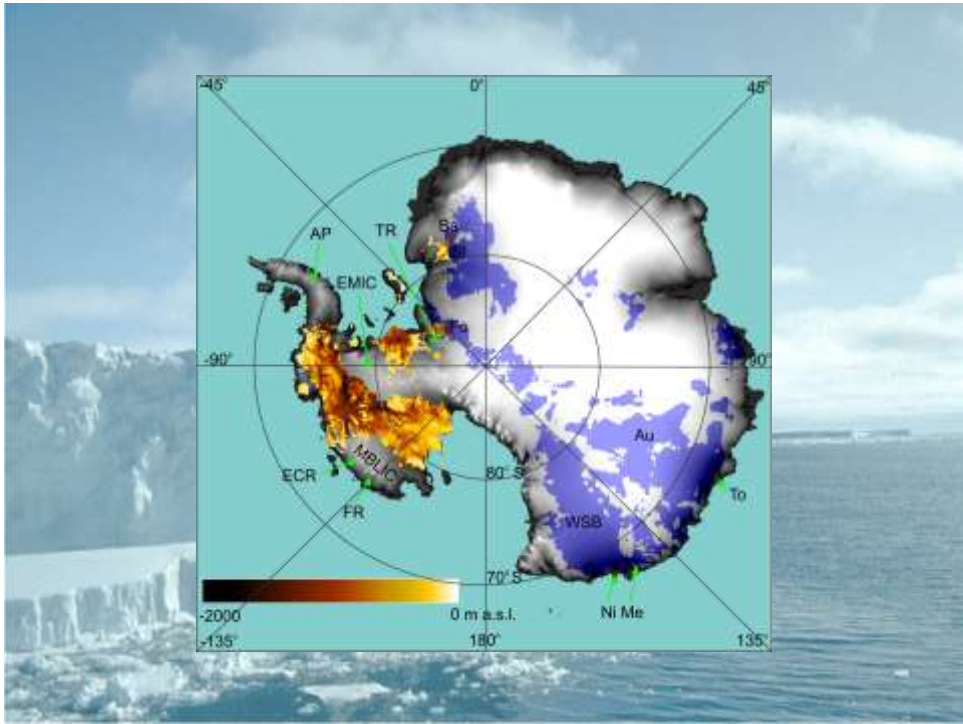
ATMOSPHERIC carbon dioxide traps some of the long-wave radiation emitted by the Earth's surface (principally near 15 μm wavelength), thereby tending to warm the troposphere. This

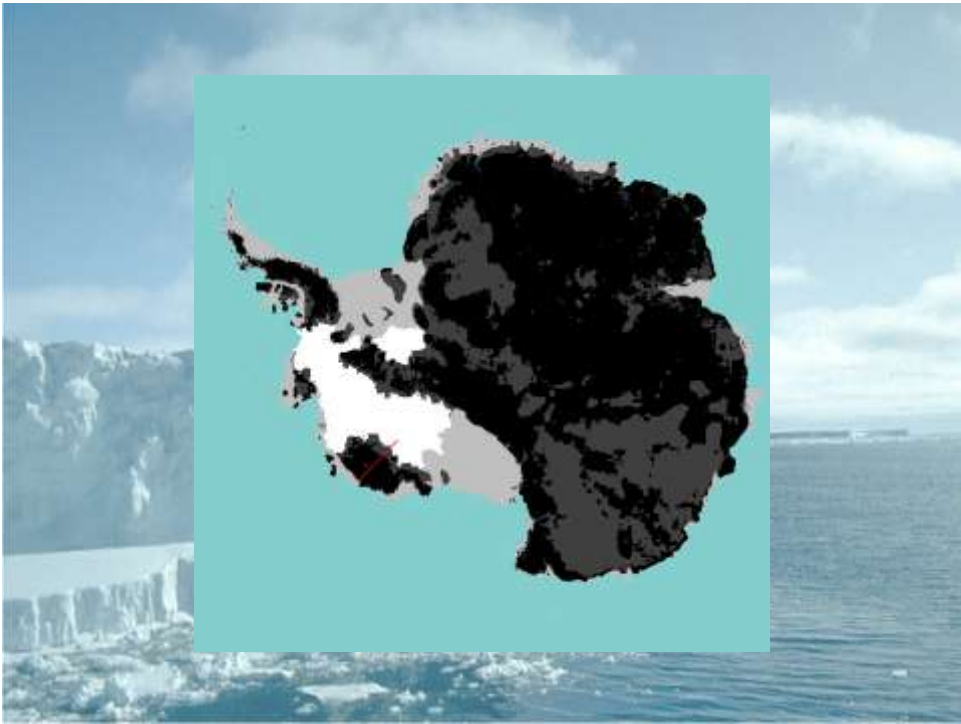
if so, the actual doubling time for atmospheric CO₂ content is likely to be nearer 50 than 200 years.

Many attempts have been made to estimate by climatic modelling the average global rise in temperature that would result from a doubling of atmospheric CO₂ content. The figures obtained have ranged from 0.7 K to 9.6 K, and Schneider¹ has critically examined the models in an attempt to clear up the confusion created by these widely different estimates. He points out that some of the models give unrealistic results because they compute an equilibrium condition for the Earth's surface rather than for the Earth-atmosphere system as a whole. He stresses the advantages of radiative-convective models, which take into account vertical motions of the

Marine Ice Sheet Instability Hypothesis (MISIH)





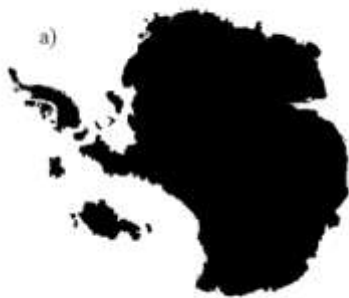


What's left:

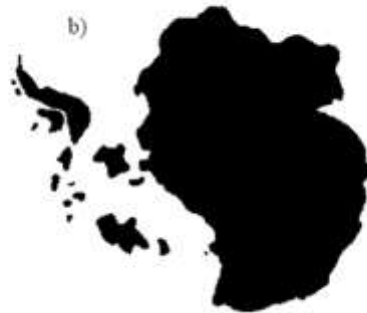
This study

Mercer 1978 (Scherer 1998)

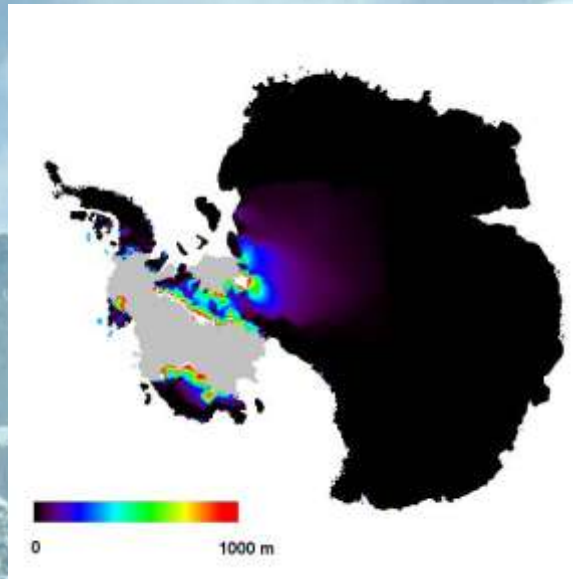
a)



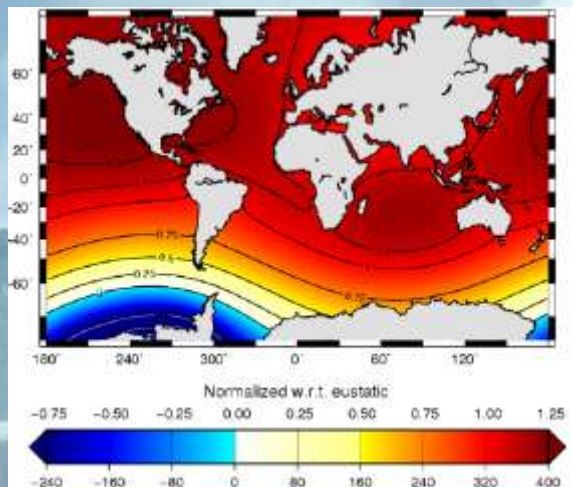
b)

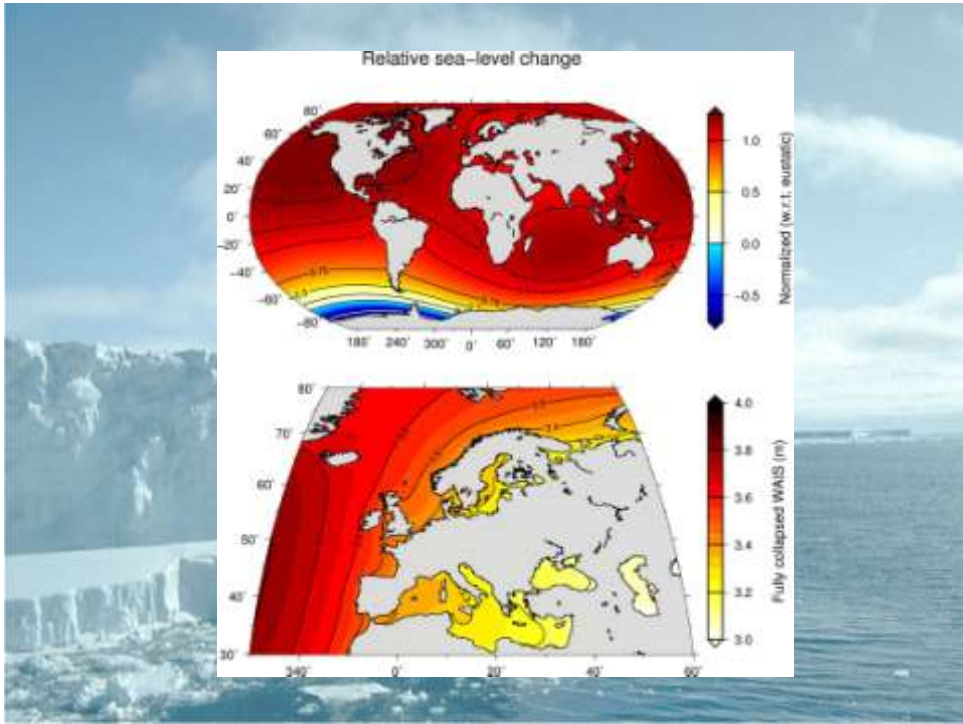


And what happens to what's left?

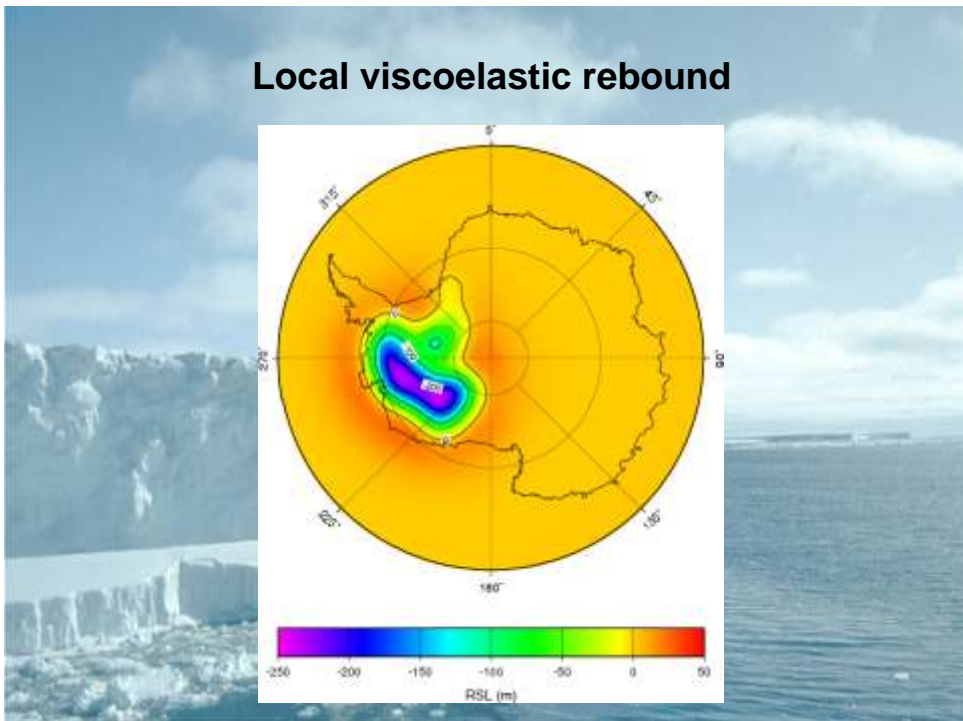


SLR after WAIS collapse:

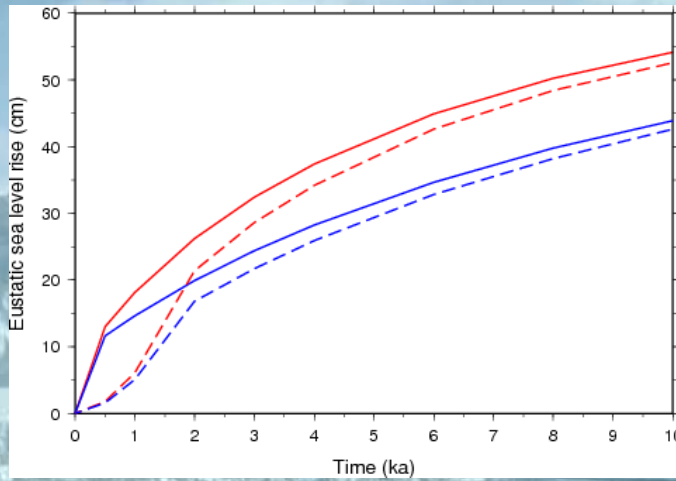




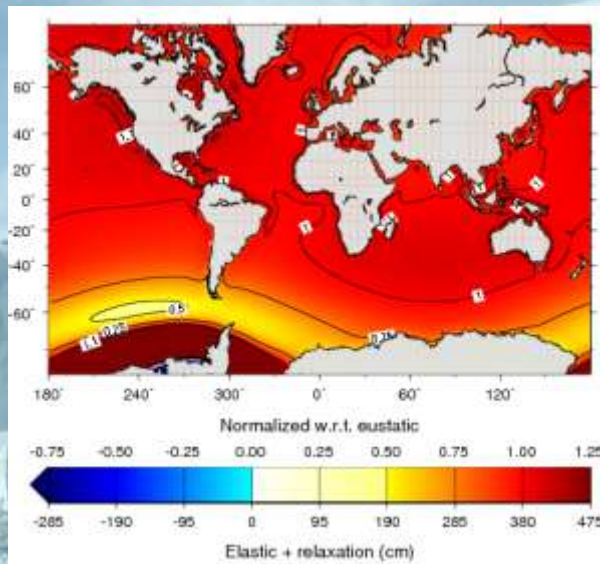
Local viscoelastic rebound



Additional SLR due to local rebound



SLR after 10,000 years:



Conclusions

- Eustatic contribution at 1kyr 3.2 m. Overestimated by ~65-110%
- Additional 60-100 cm at 10 kyr.
- Regional variations v. important: maxima lie along Pacific/Atlantic US seaboard: 1.25 x eustatic.

