Introduction

Future changes in marine particle export production (EP) and their drivers are currently not well understood. Here we compare future projections of four different marine ecosystem models under IPCC’s high emission scenario RCP8.5 over the 21st century with respect to changes in EP and export efficiency.

Differences in future EP drivers

To understand why EP is changing, we first divide it into the effects of NPP and e-ratio:

\[
\text{EP} = \text{NPP} \times \text{e-ratio}
\]

And then further divide the e-ratio into the effect of particle formation processes (f-ratio) and the effect of sinking processes (s-ratio):\n
\[
\text{e-ratio} = \frac{\text{f-ratio}}{\text{NPP}} \times \text{s-ratio}
\]

The f-ratio describes the fraction of NPP that is formed into particles:

\[
\text{f-ratio} = \frac{\text{particle formation}}{\text{NPP}}
\]

The s-ratio describes the fraction of particles that sink through the 100m depth level:

\[
\text{s-ratio} = \frac{\text{EP}}{\text{particle formation}}
\]

Models suggest decreases in global EP between -1 and -12%:

Models do not agree if more or less particles will be formed relative to NPP, but most models agree on more intense remineralization in future: