

Whose CO₂ is it Anyway?

Factor/Issue	Ocean Surface Calcification (Marohasy Hypothesis)	IPCC Position & Assumptions	Comparative Analysis & Implications
Source of post-LIA CO₂ increase	Significant portion (~90–100 ppm) due to enhanced ocean surface calcification as temperatures rose.	Majority (~100–120 ppm) attributed to fossil fuel emissions and land-use change since ~1850.	Marohasy hypothesis presents a competing natural source, challenging the attribution of most CO ₂ rise to human activity.
Estimated atmospheric CO₂ increase since LIA	~140 ppm total (from ~280 to ~420 ppm). Suggests calcification contributed 60–70% of this rise.	~140 ppm total, with ~75–85% attributed to fossil fuel emissions.	Major attribution conflict. If calcification is responsible for a large share, IPCC attribution is significantly overstated.
Mechanism of CO₂ release	Warming increases biological calcification, which releases ¹² C-enriched CO ₂ to the atmosphere.	Human combustion of fossil fuels releases CO ₂ with a low ¹³ C/ ¹² C ratio, altering atmospheric ¹³ C.	Both mechanisms affect isotope ratios, but IPCC dismisses ocean calcification as a major contributor.
Impact on carbon isotope ratio (δ¹³C)	Surface calcification emits CO ₂ depleted in ¹³ C, similar to fossil fuels, lowering atmospheric ¹³ C.	Declining ¹³ C is used as strong evidence for fossil fuel attribution.	IPCC may be misattributing ¹³ C changes, as ocean processes could produce similar isotopic signatures.
Timescale of effect	Long-term natural feedback accelerating since the end of the Little Ice Age (~150 years).	Primarily a modern industrial-era phenomenon (~since 1850).	Oceanic calcification spans both natural and anthropogenic eras, complicating the fossil fuel attribution timeline.
Response to temperature change	Calcification increases with warming due to biological and chemical sensitivity.	Warming is seen as a response to CO ₂ increase, not a cause of CO ₂ release.	Reverses causality: Marohasy sees temperature driving CO ₂ (natural outgassing), not the other way around.
Policy implications	Suggests large part of CO ₂ rise is natural and not easily controllable via emission reductions.	CO ₂ rise is anthropogenic and controllable through emissions cuts (Net Zero policies).	Undermines the foundation for urgent mitigation if much of CO ₂ increase is naturally sourced.