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Beyond the Climate Change Consensus

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Scientific advisor

Budapest, 8 December 2025

HUN-REN Institute of Earth Physics and Space Science

International conference providing an insight into the science beyond the climate change consensus and its consequence to energy policies

https://hun-ren.hu/en

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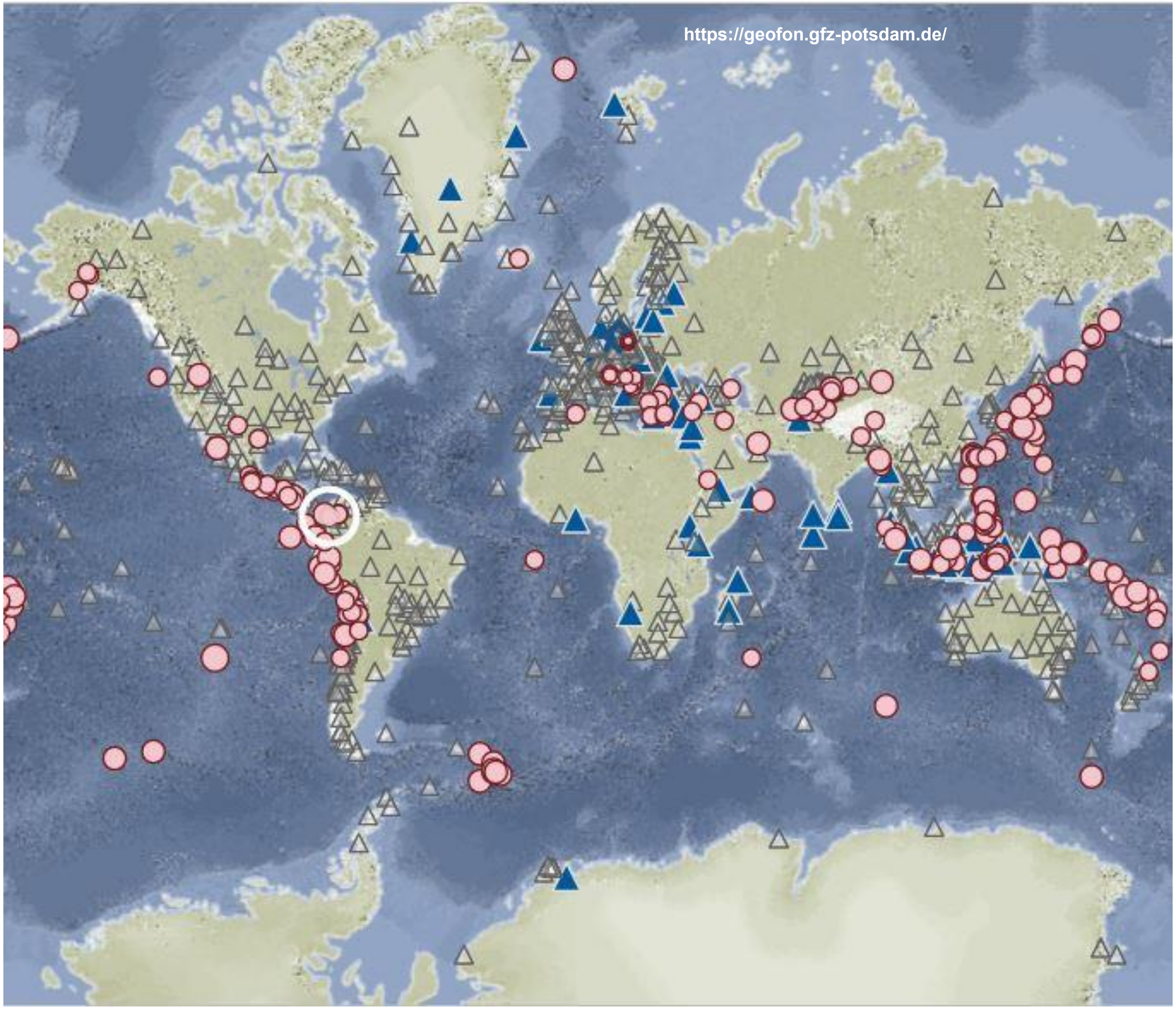
Geological CO_2 emissions



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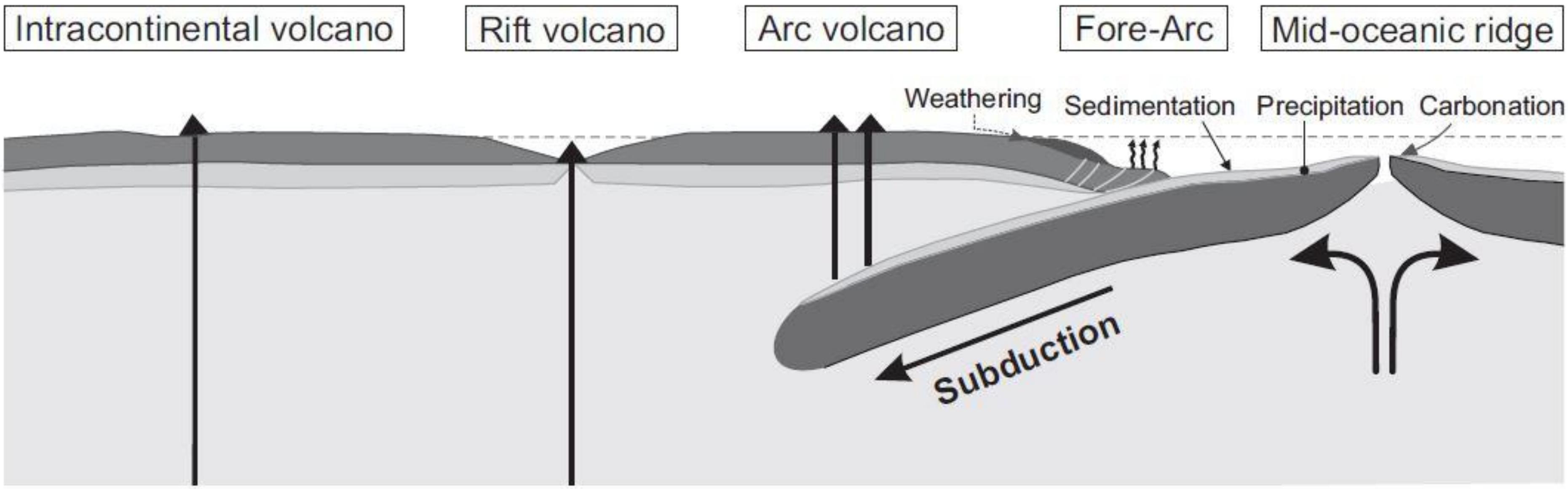
Geological CO_2 emissions



Burton et al. (2013)

Geological CO_2 emissions

Eos, Vol. 92, No. 24, 14 June 2011

EOS

EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION

VOLUME 92 NUMBER 24

14 JUNE 2011

PAGES 201–208

Volcanic Versus Anthropogenic Carbon Dioxide

PAGES 201–202

Which emits more carbon dioxide (CO_2): Earth's volcanoes or human activities? Research findings indicate unequivocally that the answer to this frequently asked question is human activities. However, most people, including some Earth scientists working in fields outside volcanology, are surprised by this answer. The climate change debate has revived and reinforced the belief, widespread among climate skeptics, that volcanoes emit more CO_2 than human activities [*Gerlach*, 2010; *Plimer*, 2009]. In fact, present-day volcanoes emit relatively modest amounts of CO_2, about as much annually as states like Florida, Michigan, and Ohio.

Volcanic and Anthropogenic CO_2 Emission Rates

Volcanic emissions include CO_2 from erupting magma and from degassing of unerupted magma beneath volcanoes. Over time, they are a major source for restoring CO_2 lost from the atmosphere and oceans by silicate weathering, carbonate deposition, and organic carbon burial [*Berner*, 2004]. Global estimates of the annual present-day CO_2 output of the Earth's degassing subaerial and submarine volcanoes range from 0.13 to 0.44 billion metric tons (gigatons) per year [*Gerlach*, 1991; *Allard*, 1992; *Varekamp et al.*, 1992; *Sano and Williams*, 1996; *Marty and Tolstikhin*, 1998]; the preferred global estimates of the authors of these studies range from 0.15 to 0.26 gigaton per year. Other aggregated volcanic CO_2 emission rate estimates—published in 18 studies since 1979 as subaerial, arc, and mid-oceanic ridge estimates—are consistent with the global estimates. For more information, see the background, table, and references in the online supplement to this *Eos* issue (http://www.agu.org/eos_elec/).

Anthropogenic CO_2 emissions—responsible for a projected 35 gigatons of CO_2 in 2010 [*Friedlingstein et al.*, 2010]—clearly dwarf all estimates of the annual present-day global volcanic CO_2 emission rate. Indeed, volcanoes emit significantly less CO_2 than land use changes (3.4 gigatons per year), light-duty vehicles (3.0 gigatons per year, mainly cars and pickup trucks), or cement production (1.4 gigatons per year). Instead, volcanic CO_2 emissions are comparable in the human realm to the global CO_2 emissions from flaring of waste gases (0.20 gigaton per year) or to the CO_2 emissions of about 2 dozen full-capacity 1000-megawatt coal-fired power stations (0.22 gigaton per year), the latter of which constitute about 2% of the world's coal-fired electricity-generating capacity. More meaningful, perhaps, are the comparable annual

BY T. GERLACH

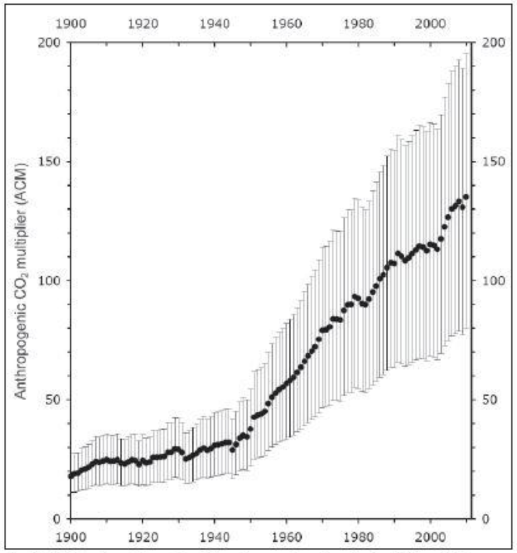
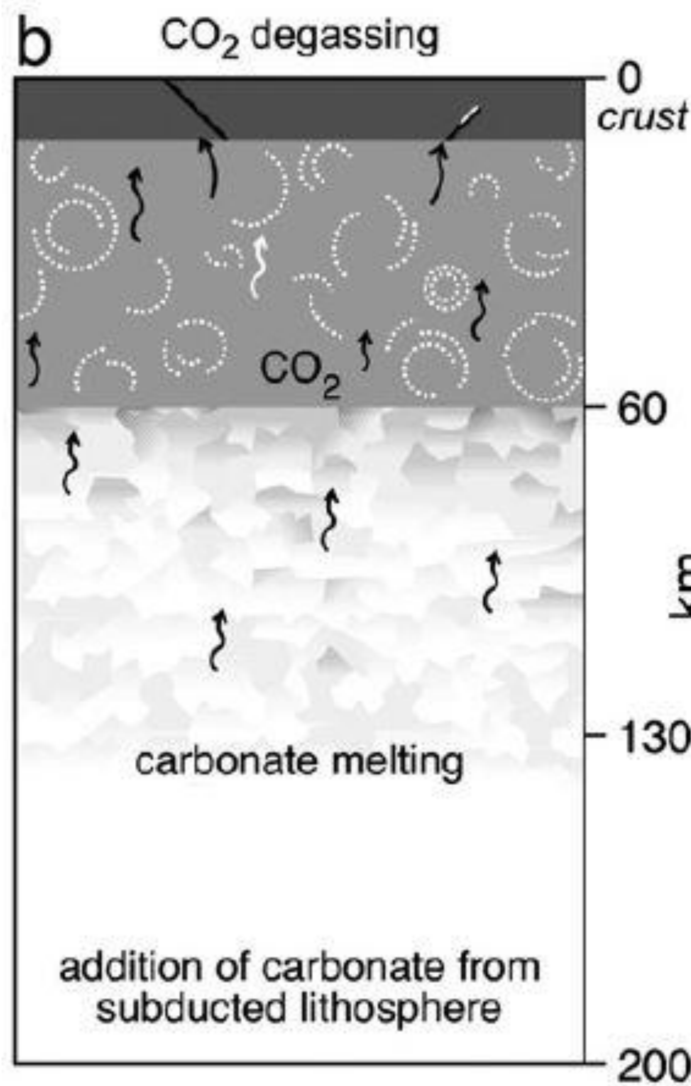


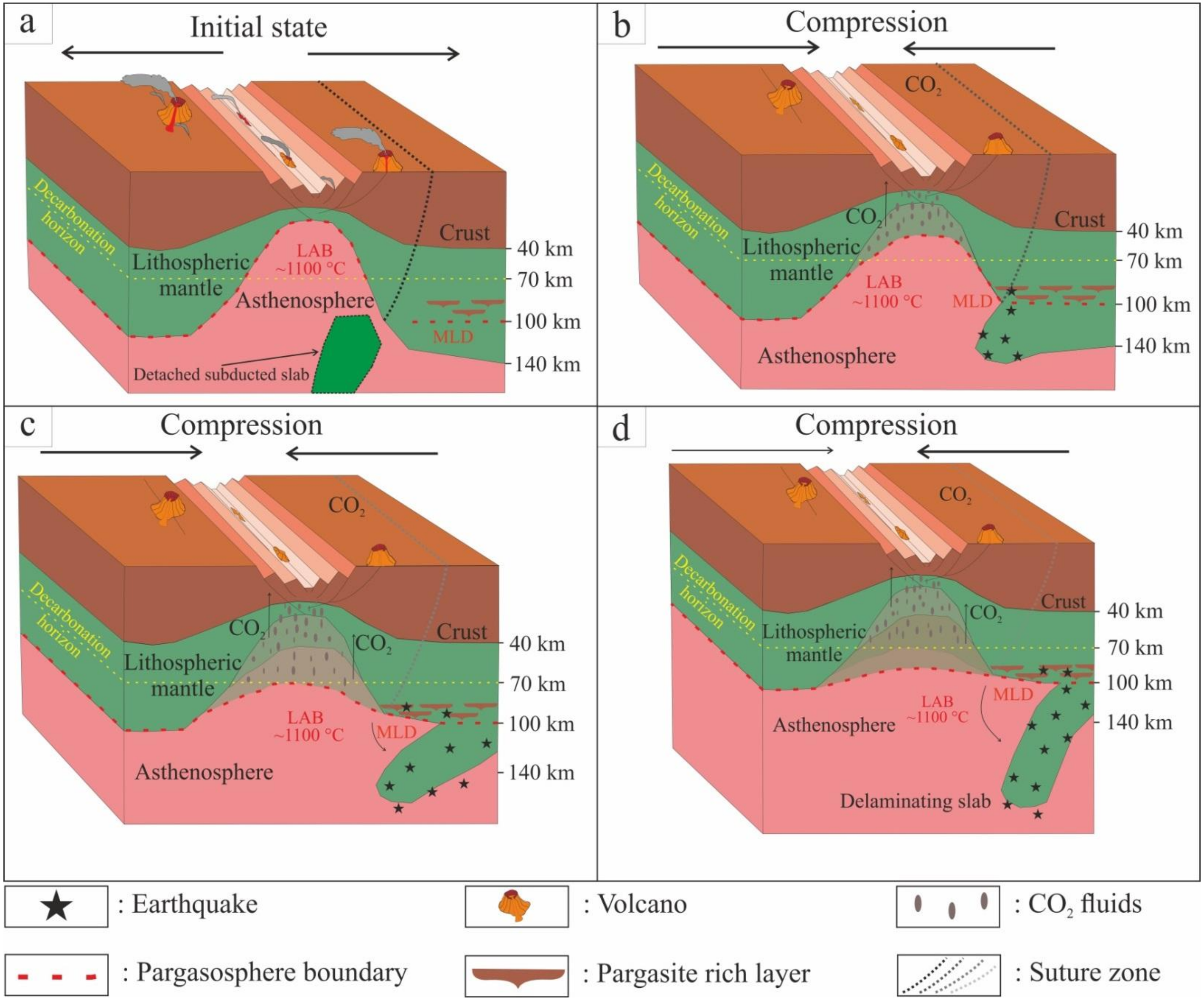
Fig. 1. Solid dots show a time series of the anthropogenic carbon dioxide (CO_2) multiplier (ACM) calculated from time series data on anthropogenic CO_2 emission rates and Marty and Tolstikhin's *[1998] 0.26-gigaton-per-year preferred global volcanic CO_2 emission rate estimate. Bars show the spread of ACM values corresponding to* Marty and Tolstikhin's *[1998] plausible range of global volcanic CO_2 emission rates (0.18–0.44 gigaton per year). Time series data on anthropogenic CO_2 include emissions from fossil fuel combustion, land use changes, cement production, and waste gas flaring [*Friedlingstein et al., *2010]. Data are from http://cdiac.ornl.gov/trends/emis/meth_reg.html, http://cdiac.esd.ornl.gov/trends/landuse/houghton/houghton.html, and http://lgmacweb.env.uea.ac.uk/lequere/co2/carbon_budget.htm.*

Gerlach et al. (2013)



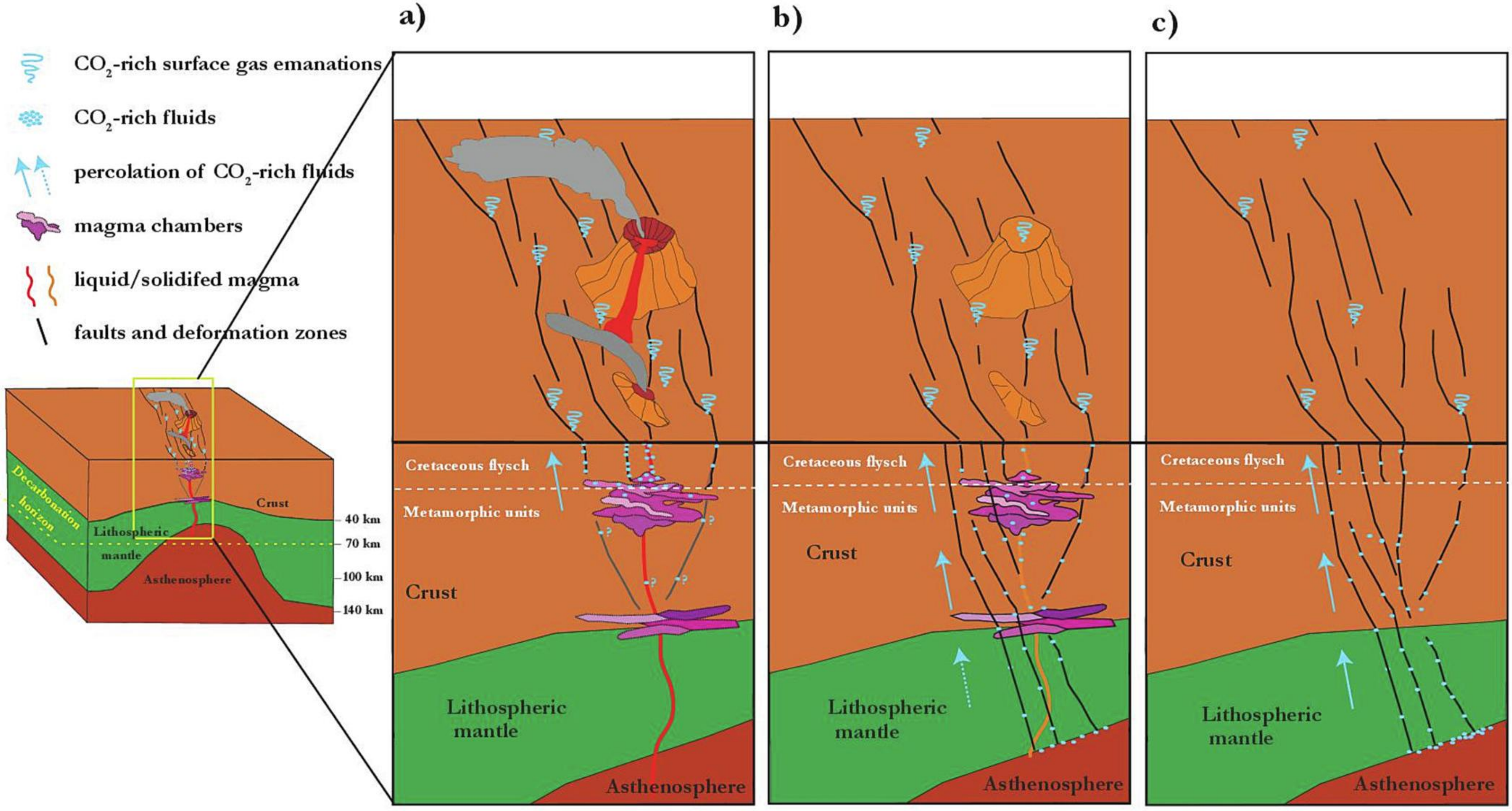
Frezotti et al. (2009)

A new hypothesis

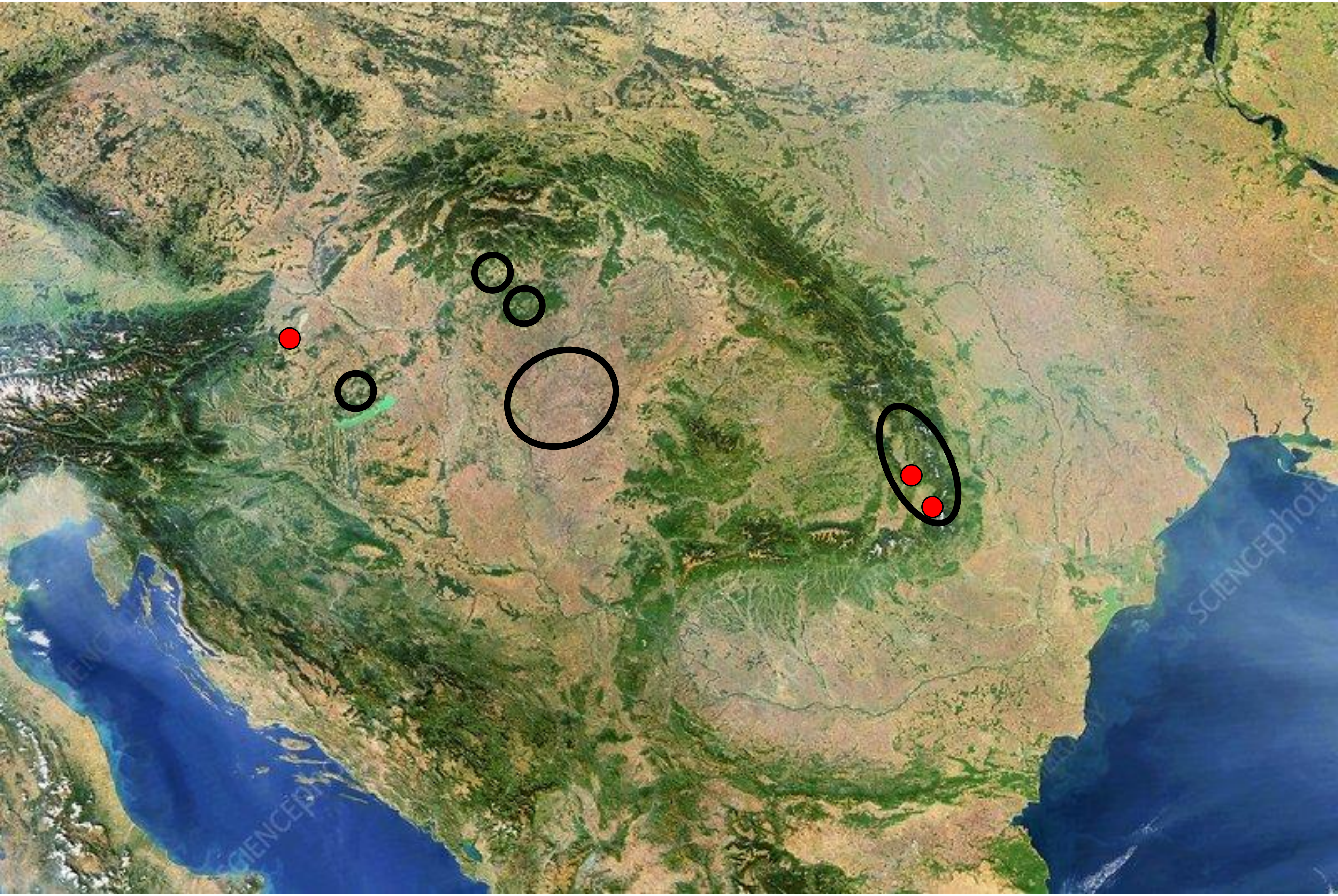


Kovács et al. (2021)

What is on Earth the novelty?



Szakács and Kovács (2023)



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Earth-Science Reviews 267 (2025) 105168

Contents lists available at ScienceDirect

Earth-Science Reviews

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Review Article

Degassing of deep fluids in the Pannonian basin and adjacent areas

Check for updates

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by O'Nions and Oxburgh (1988), and similar to what found in other tectonically active regions. The mantle-related CO_2 flux computed using $CO_2/^3He$ ratios and the mantle He fluxes, range between 10^3 and 10^5 mol·km^{-2}·year^{-1}. Despite representing a rough estimation, these values are in the range of the CO_2 fluxes in active and quiescent worldwide volcanic systems. We propose the transfer of mantle-derived volatiles to occurs through lithospheric faults in the PB and adjacent regions, although the presence of magmatic intrusions in crustal layers is an additional contributing factor.

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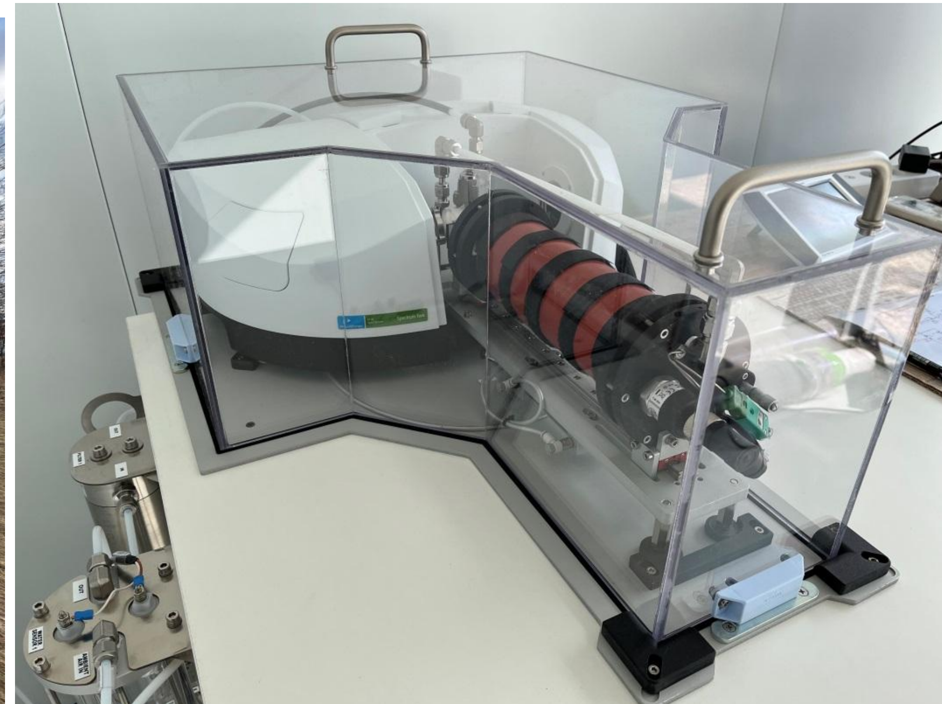
Integrated Geodynamic Station: Covasna (22.02.2023)



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