on the trail of the most energetic particles in the universe

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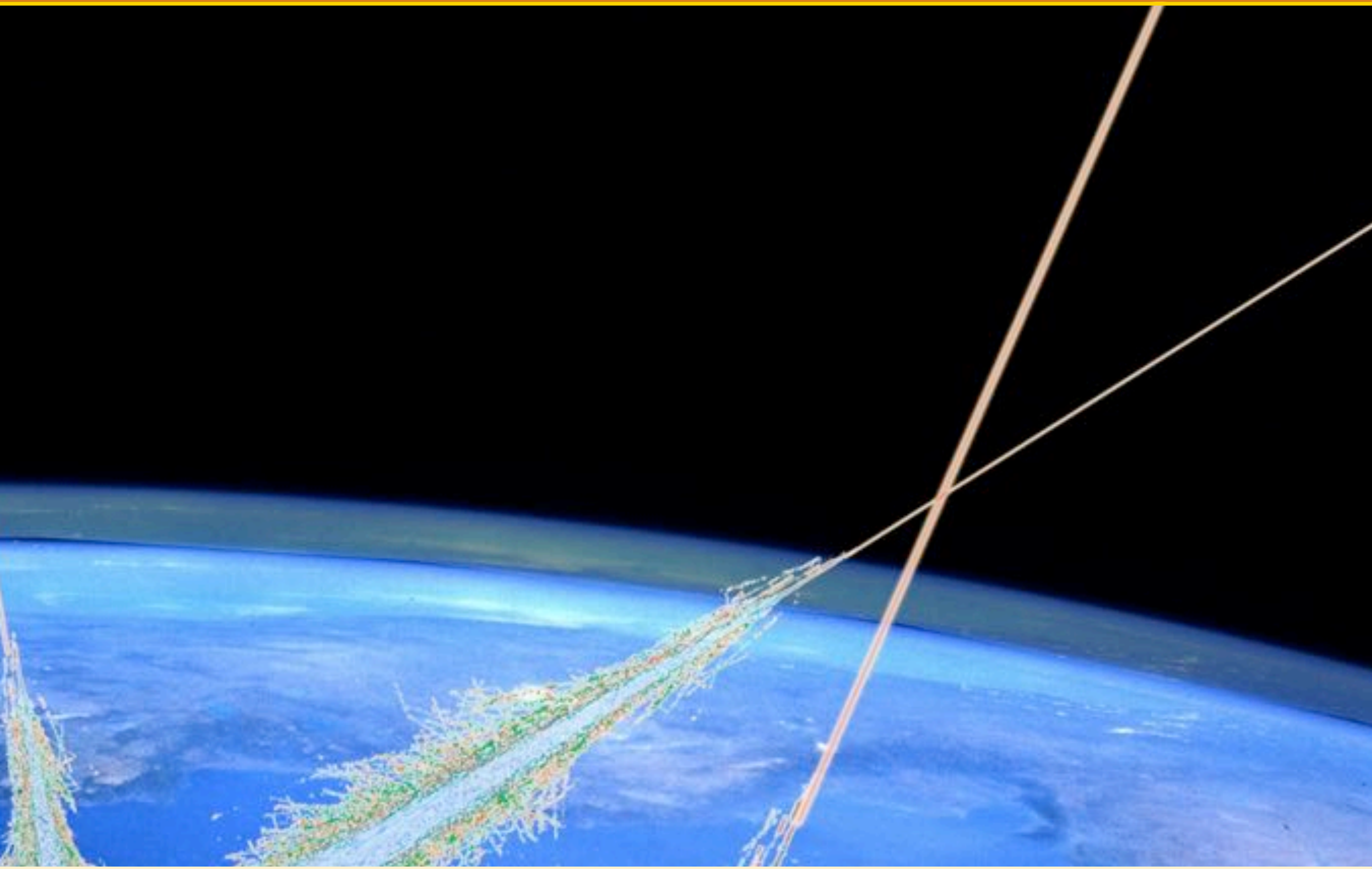
- rest of the century: particle physics with cosmic rays

what are cosmic rays?



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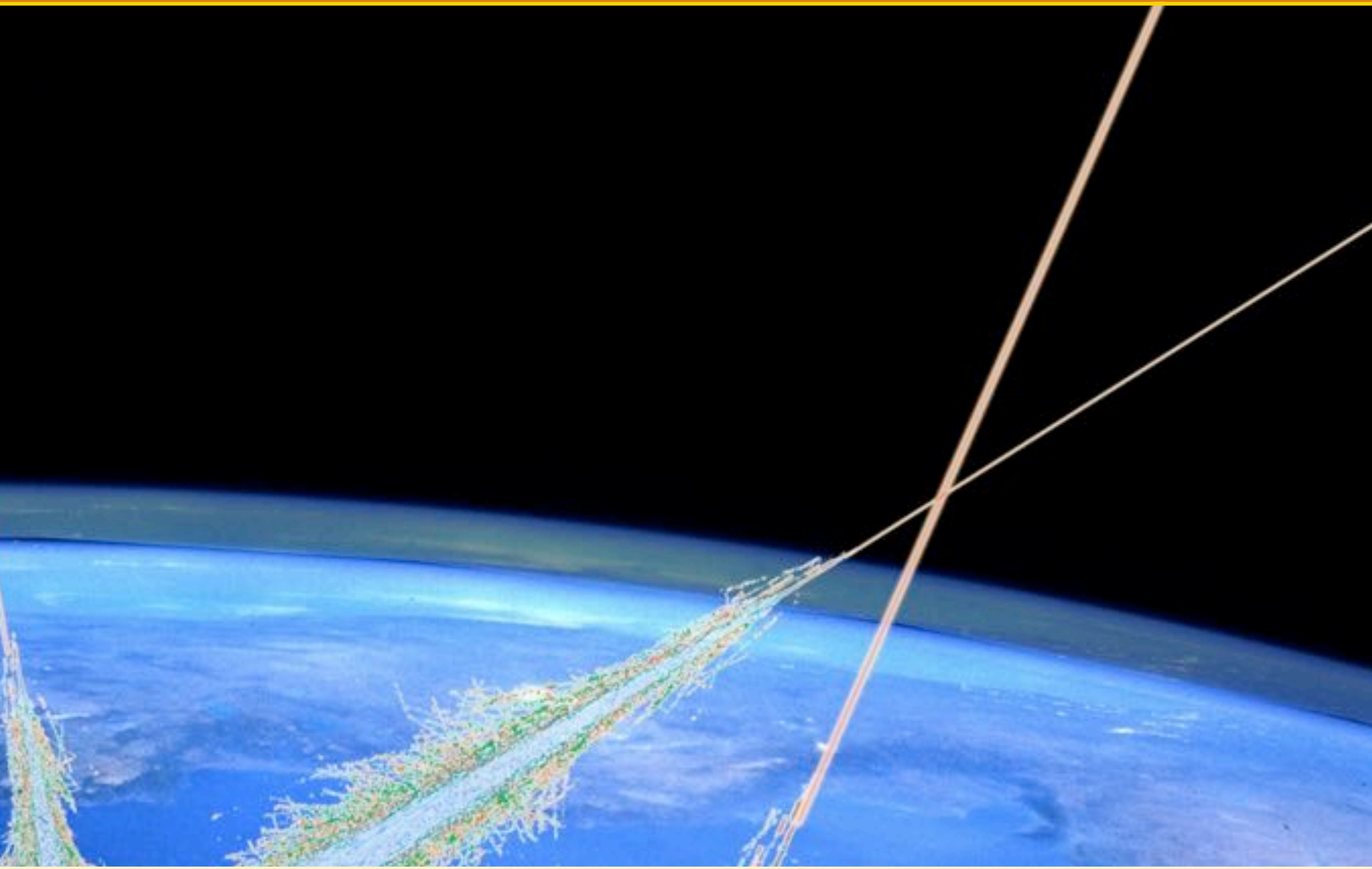

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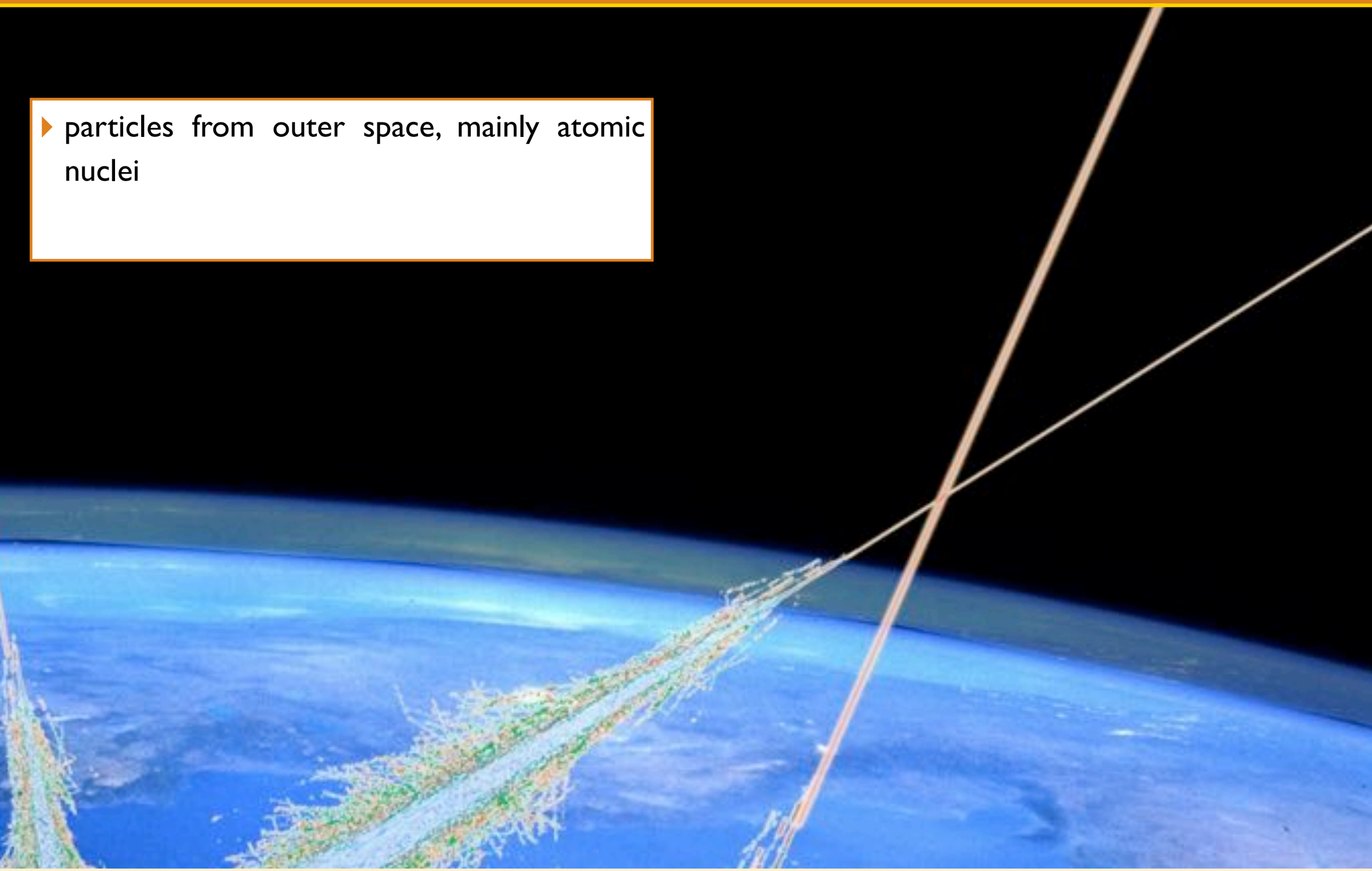

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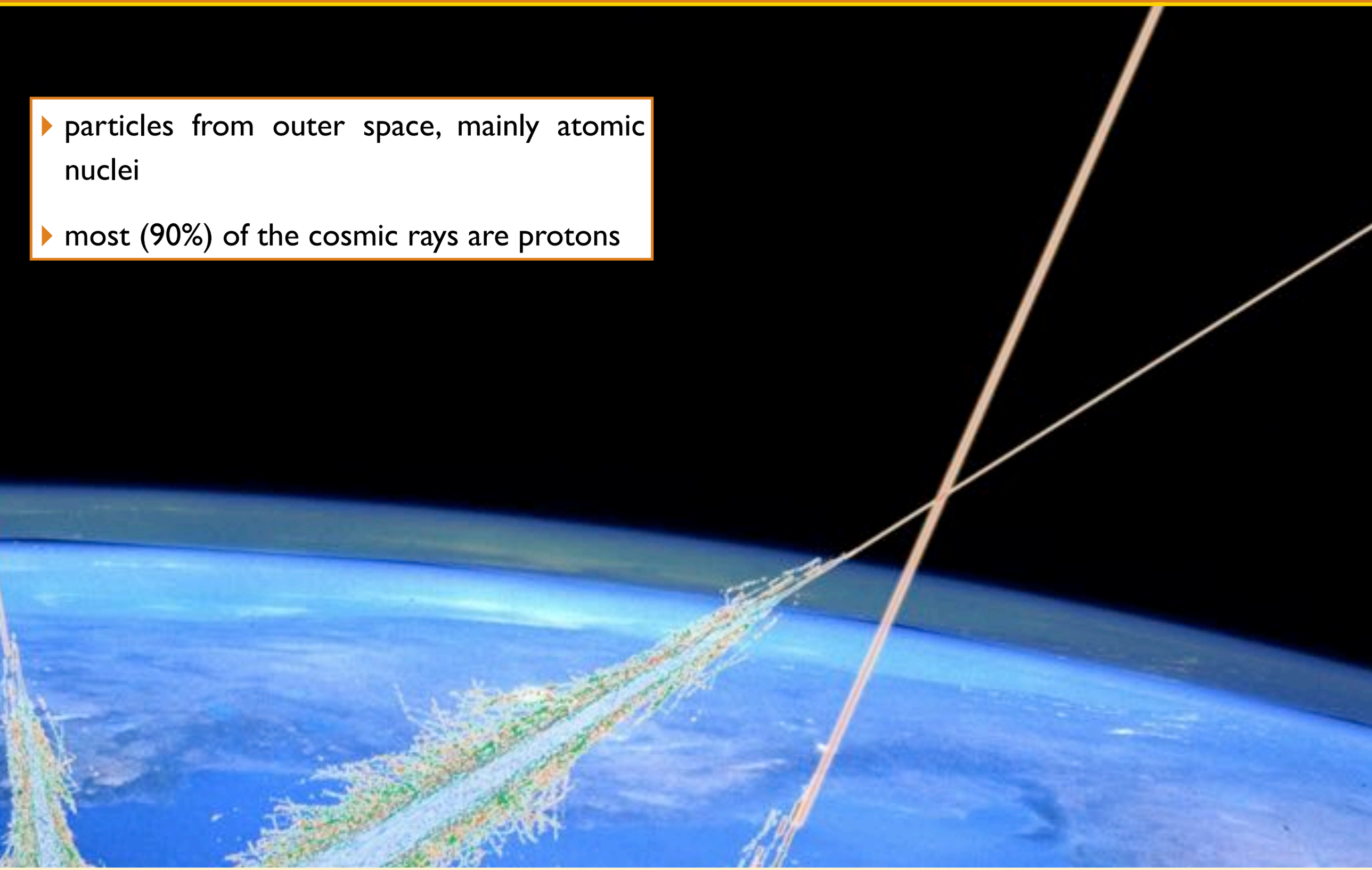
- most (90%) of the cosmic rays are protons



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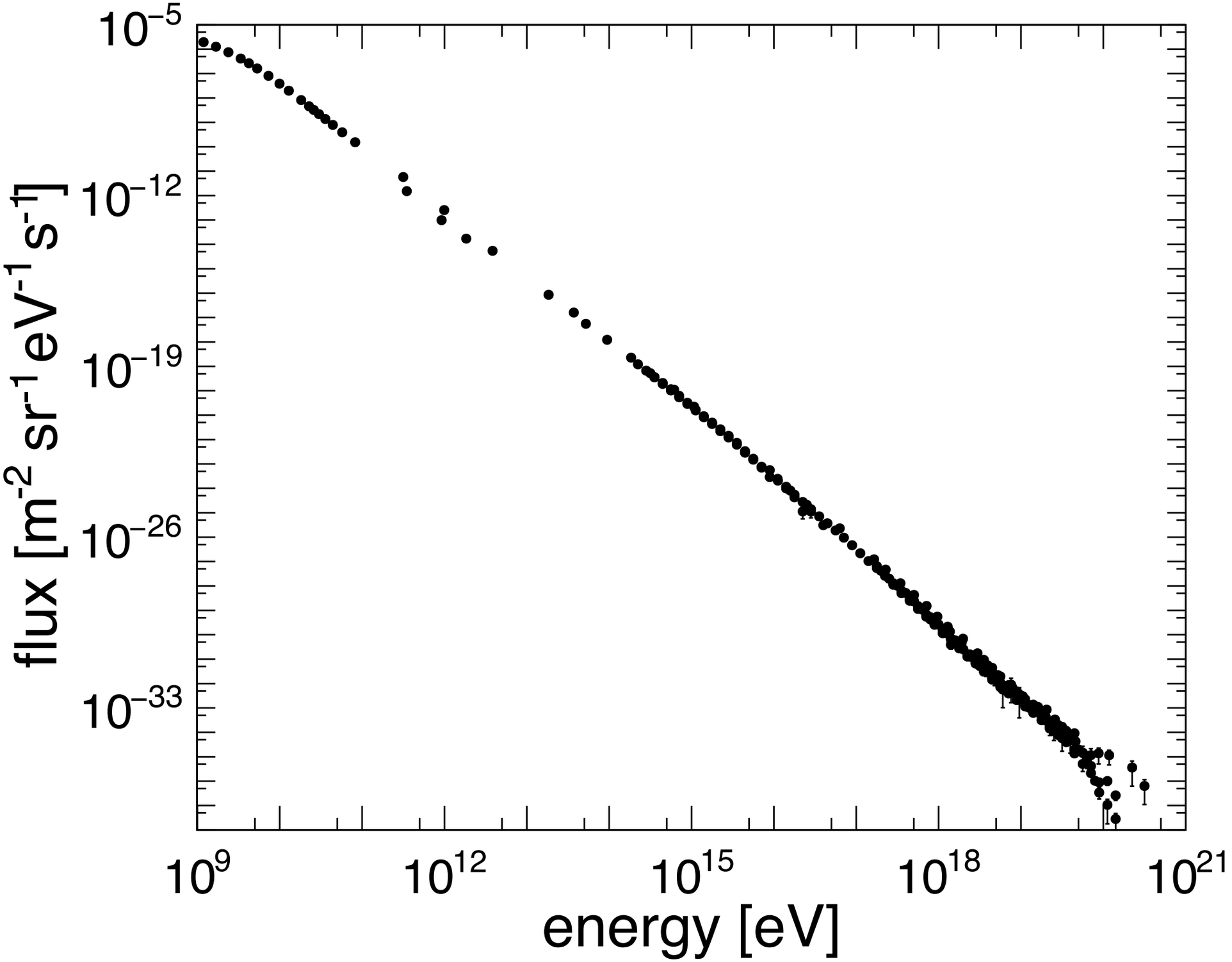

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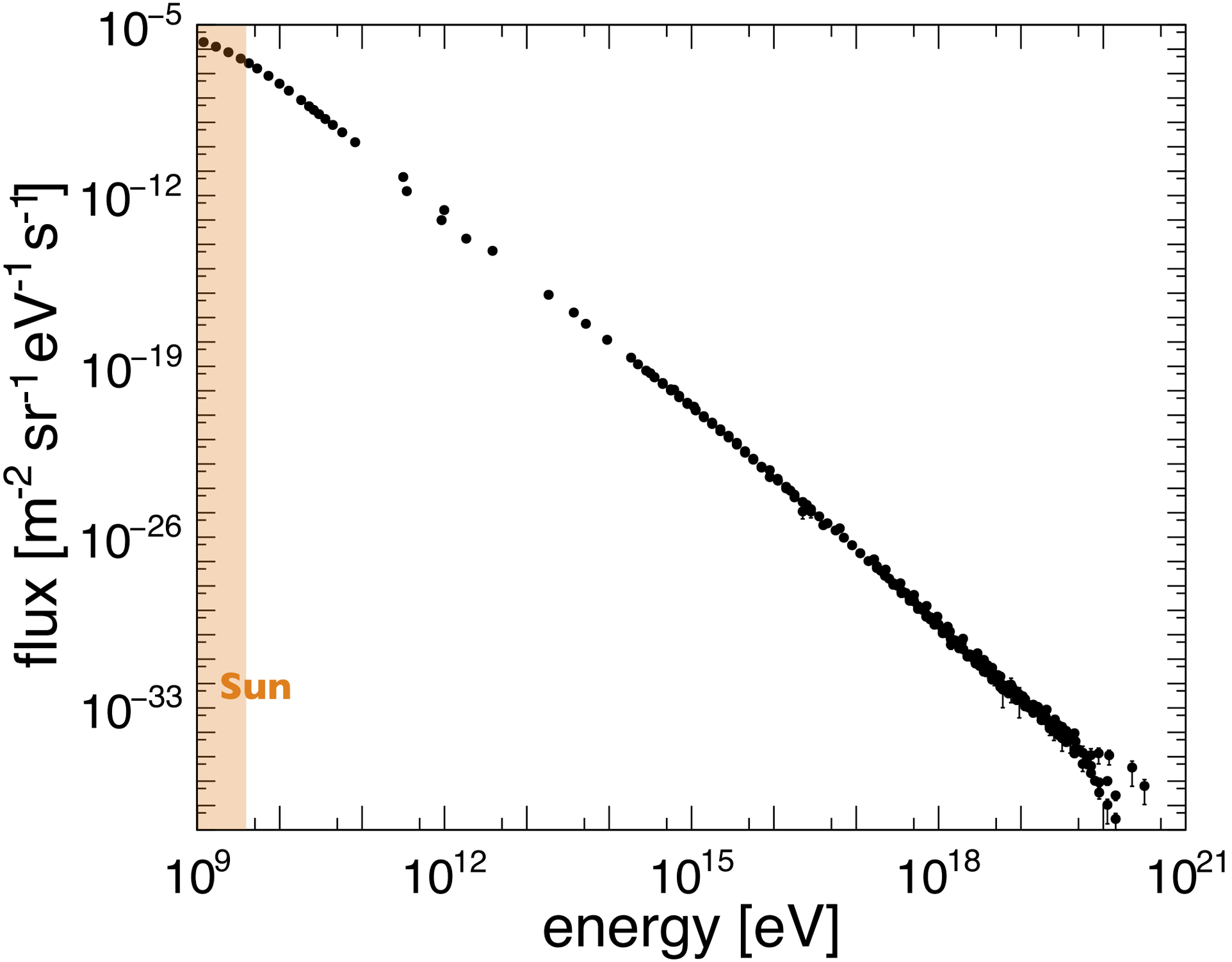

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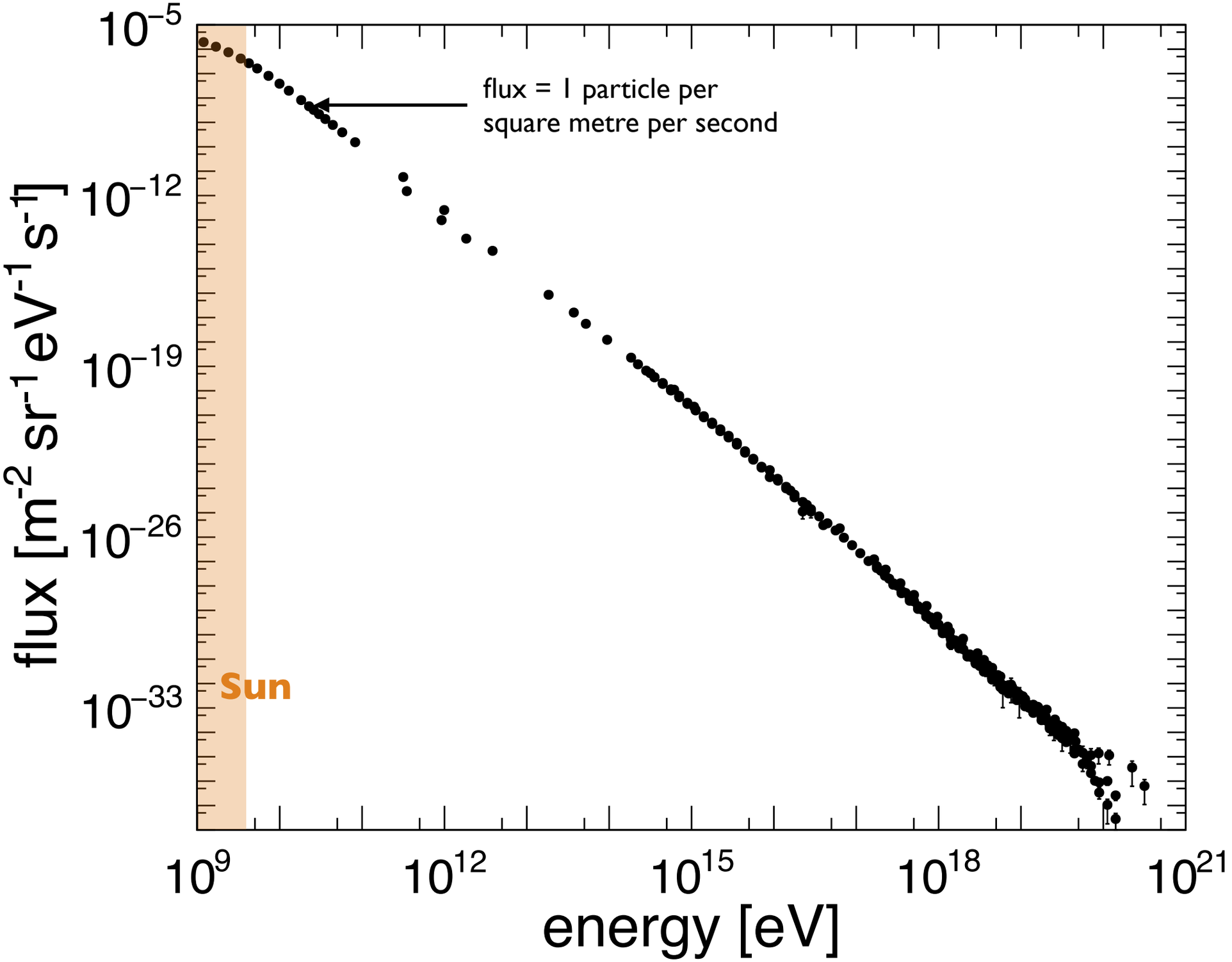

northern/sourthern lights

image credits: Kristian Pikner

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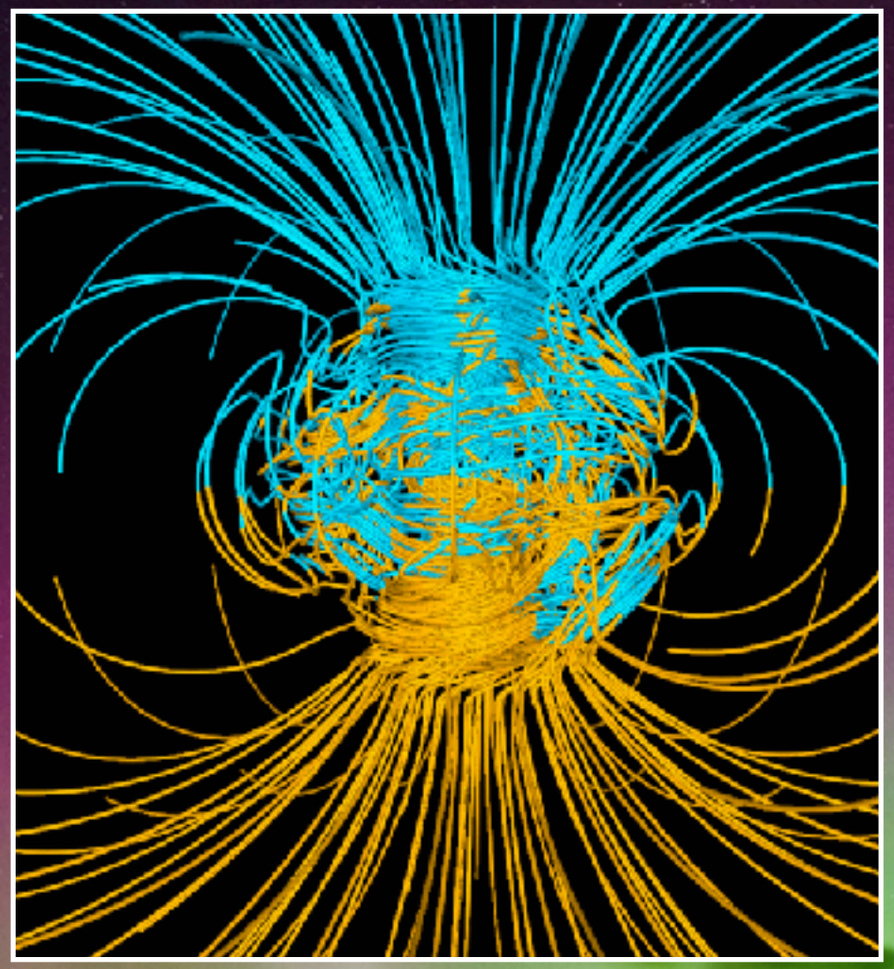

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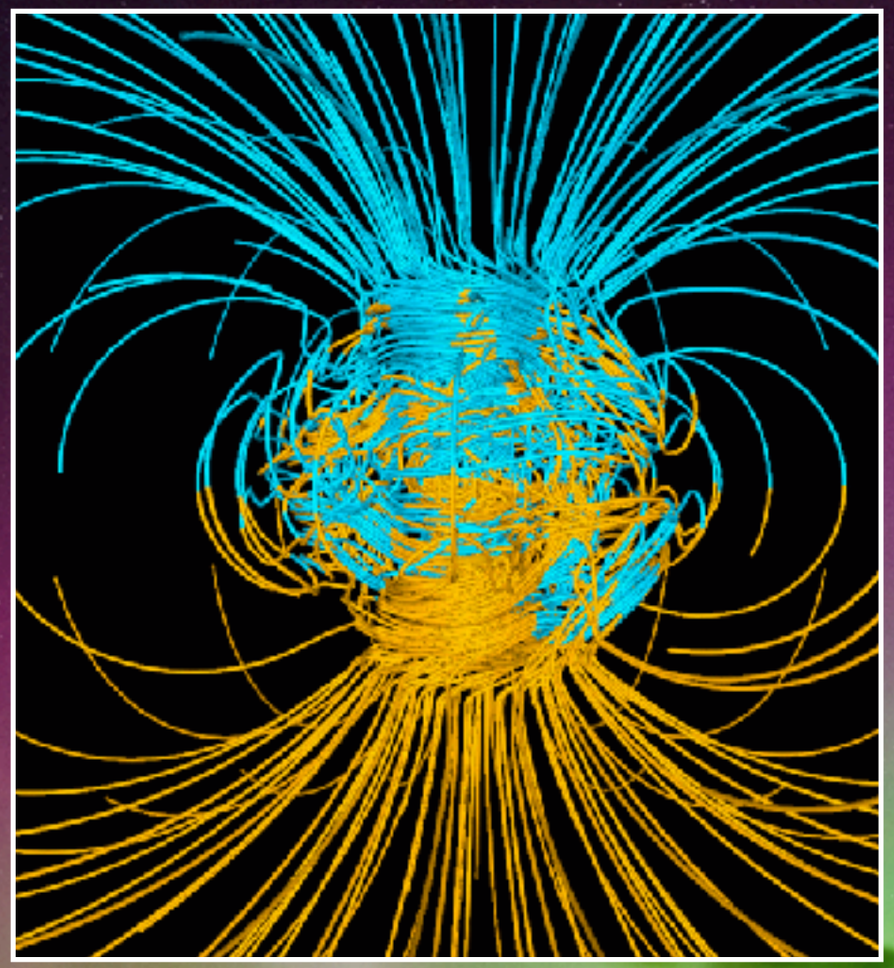

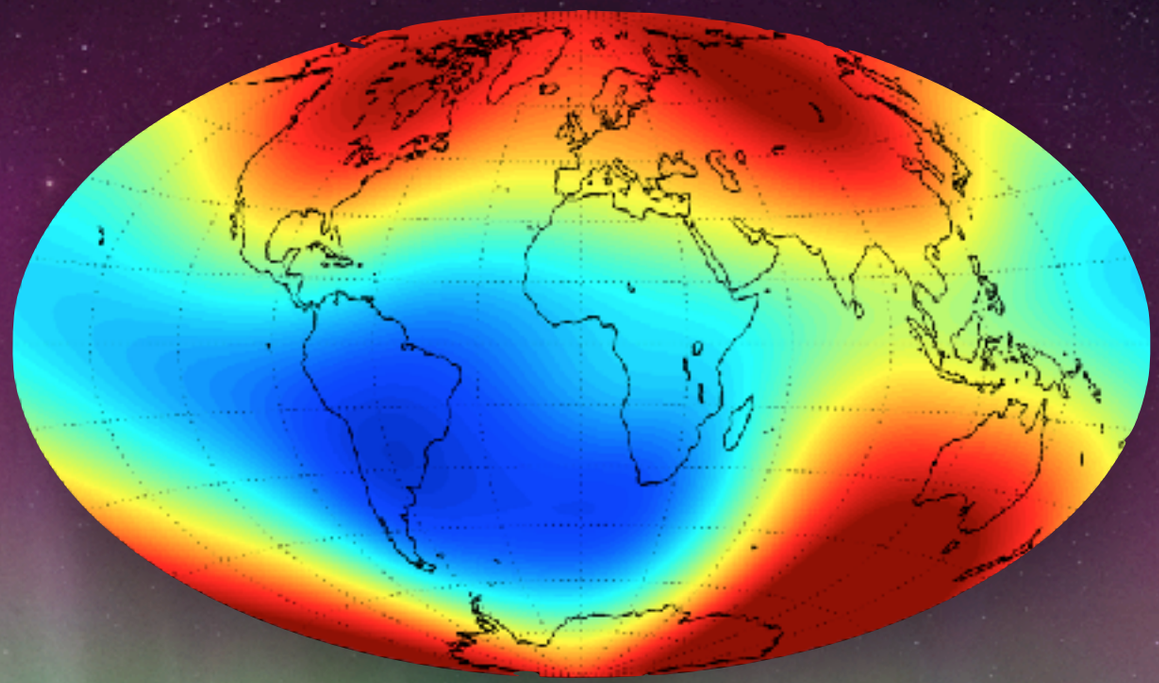

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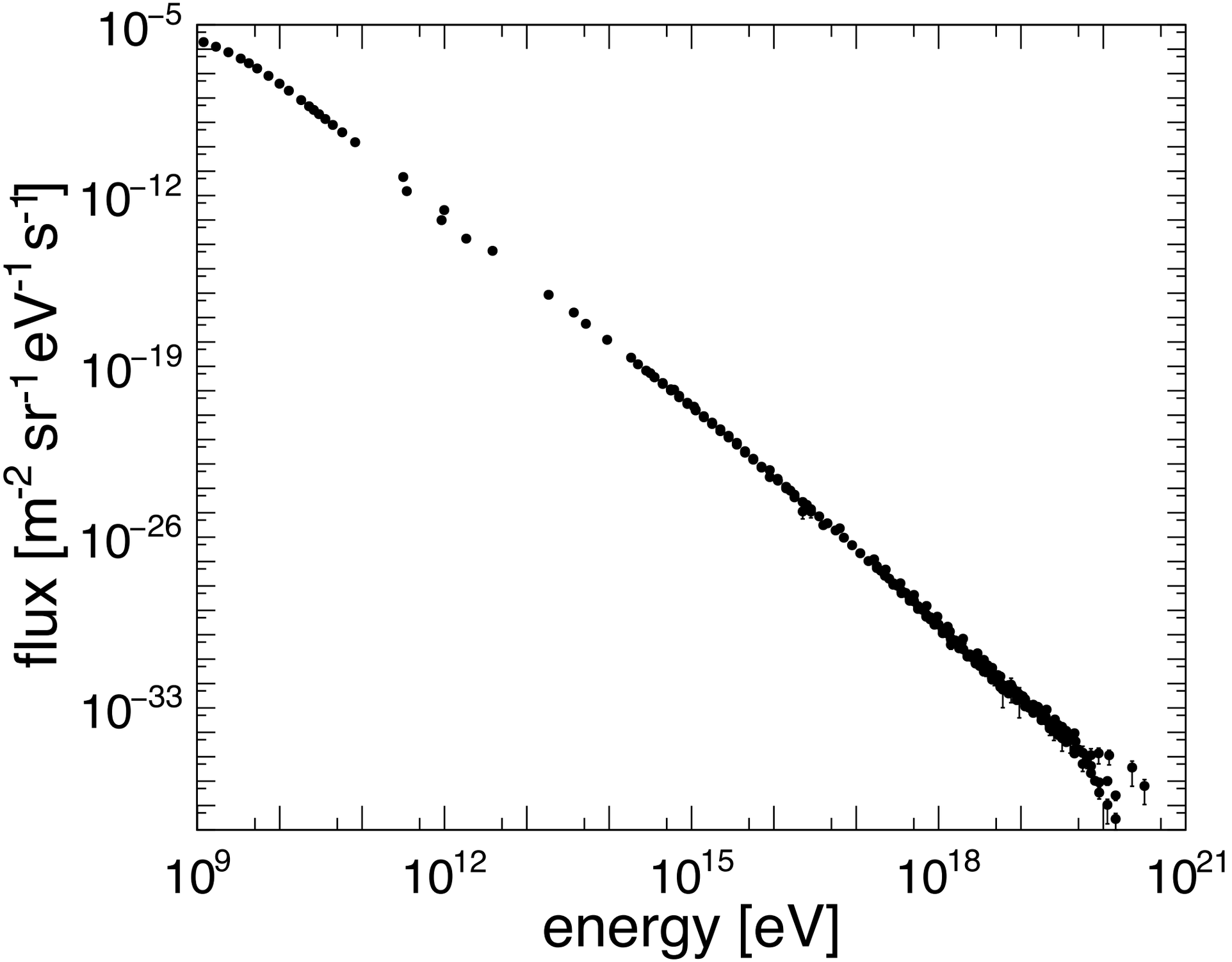

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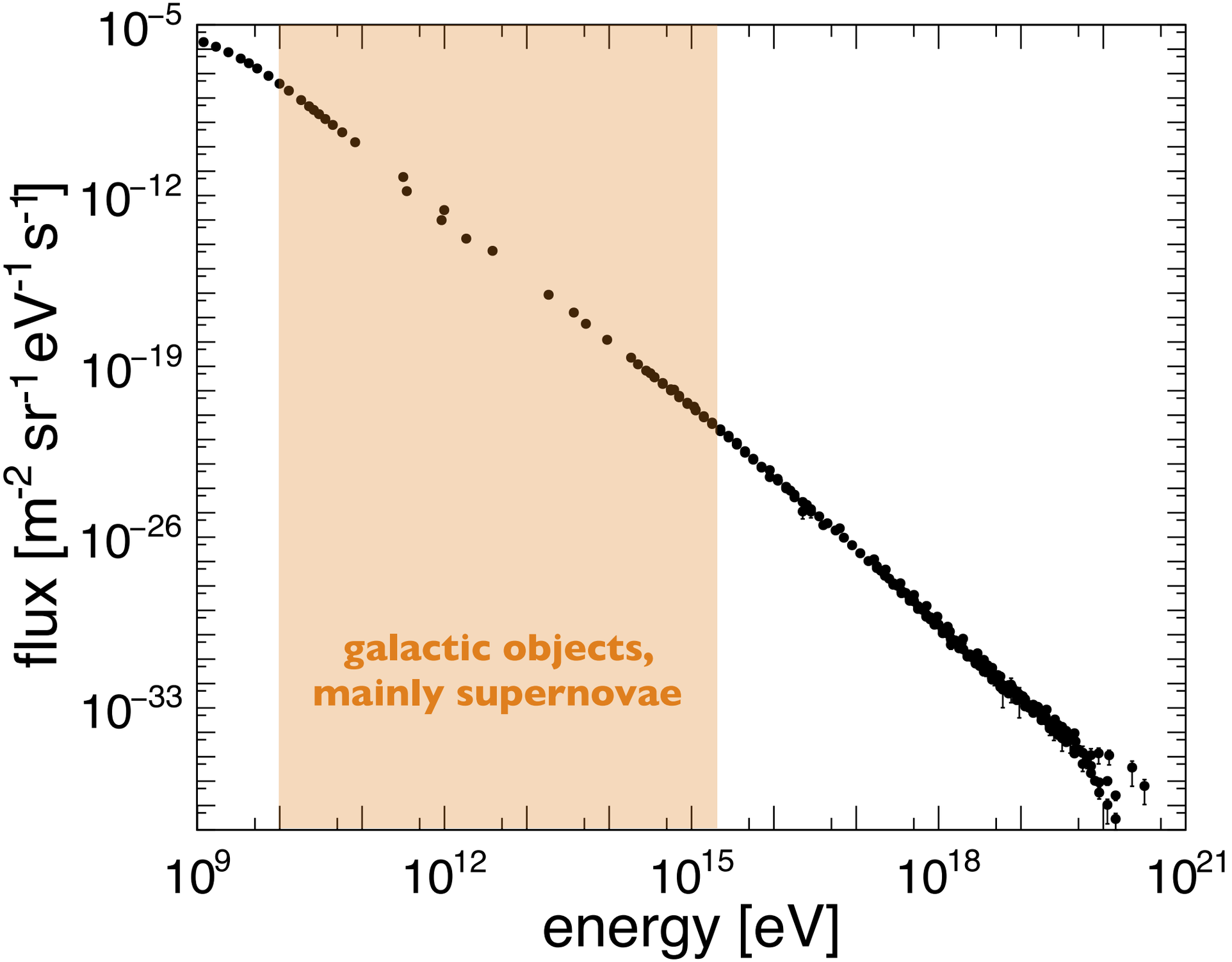

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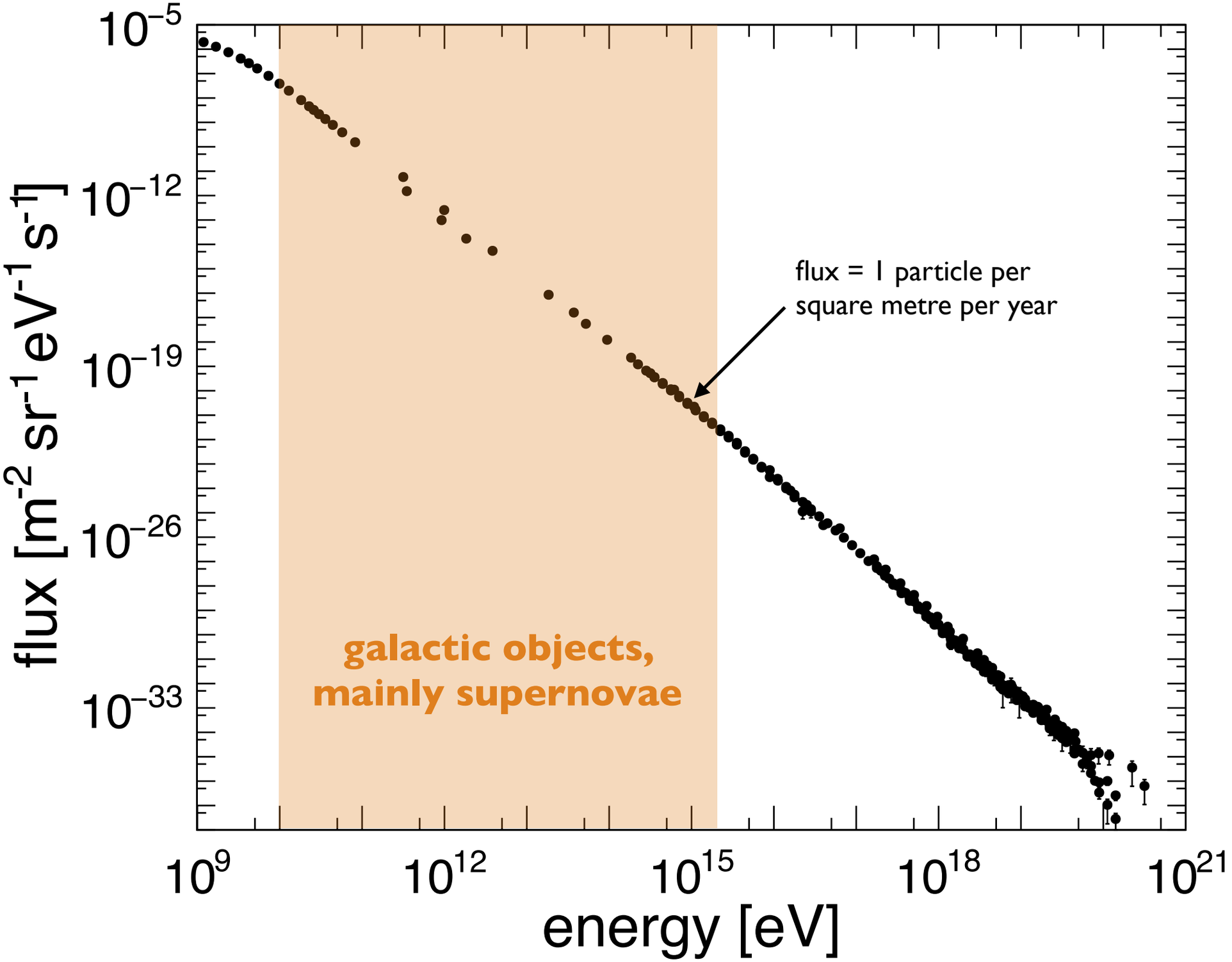

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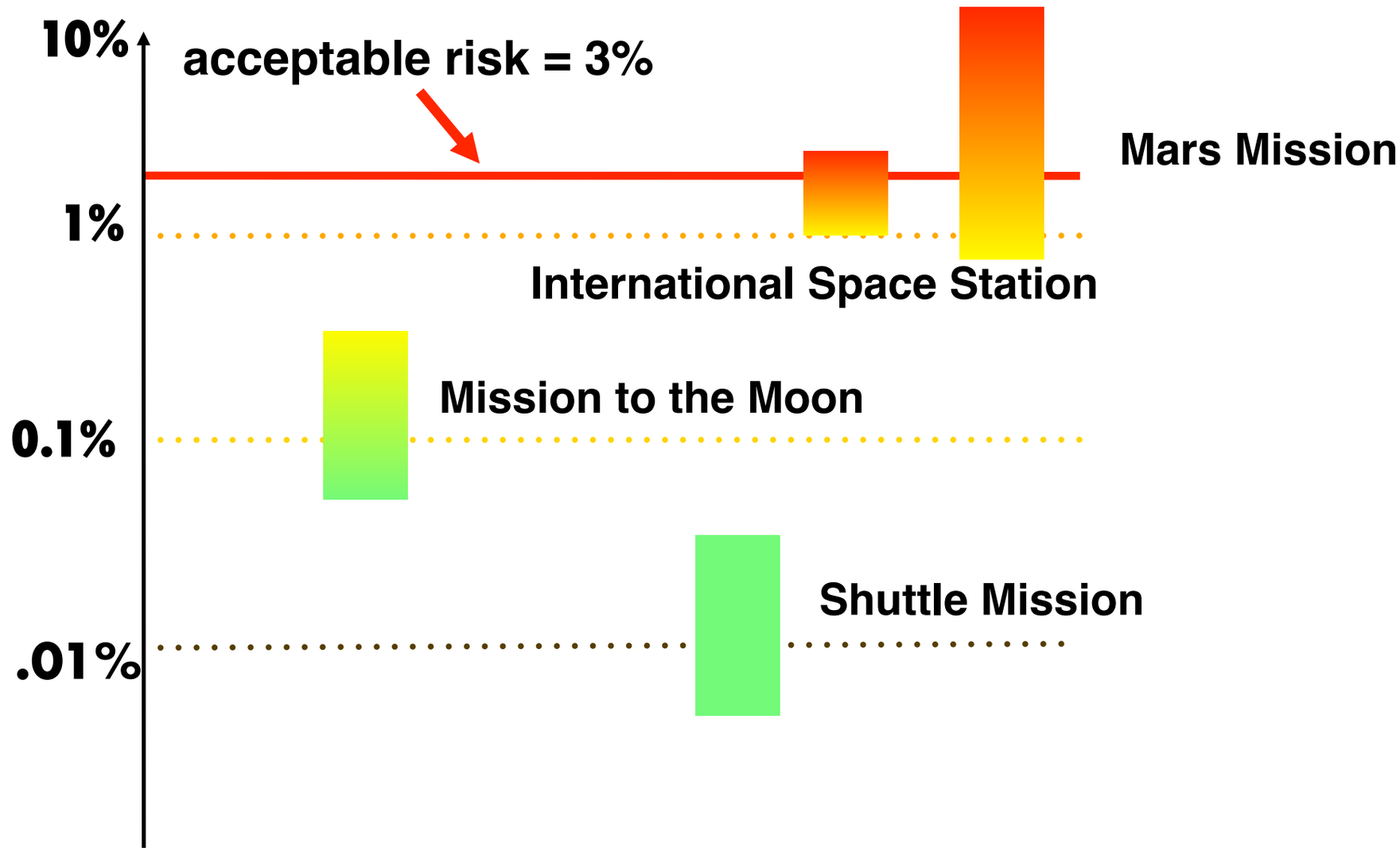

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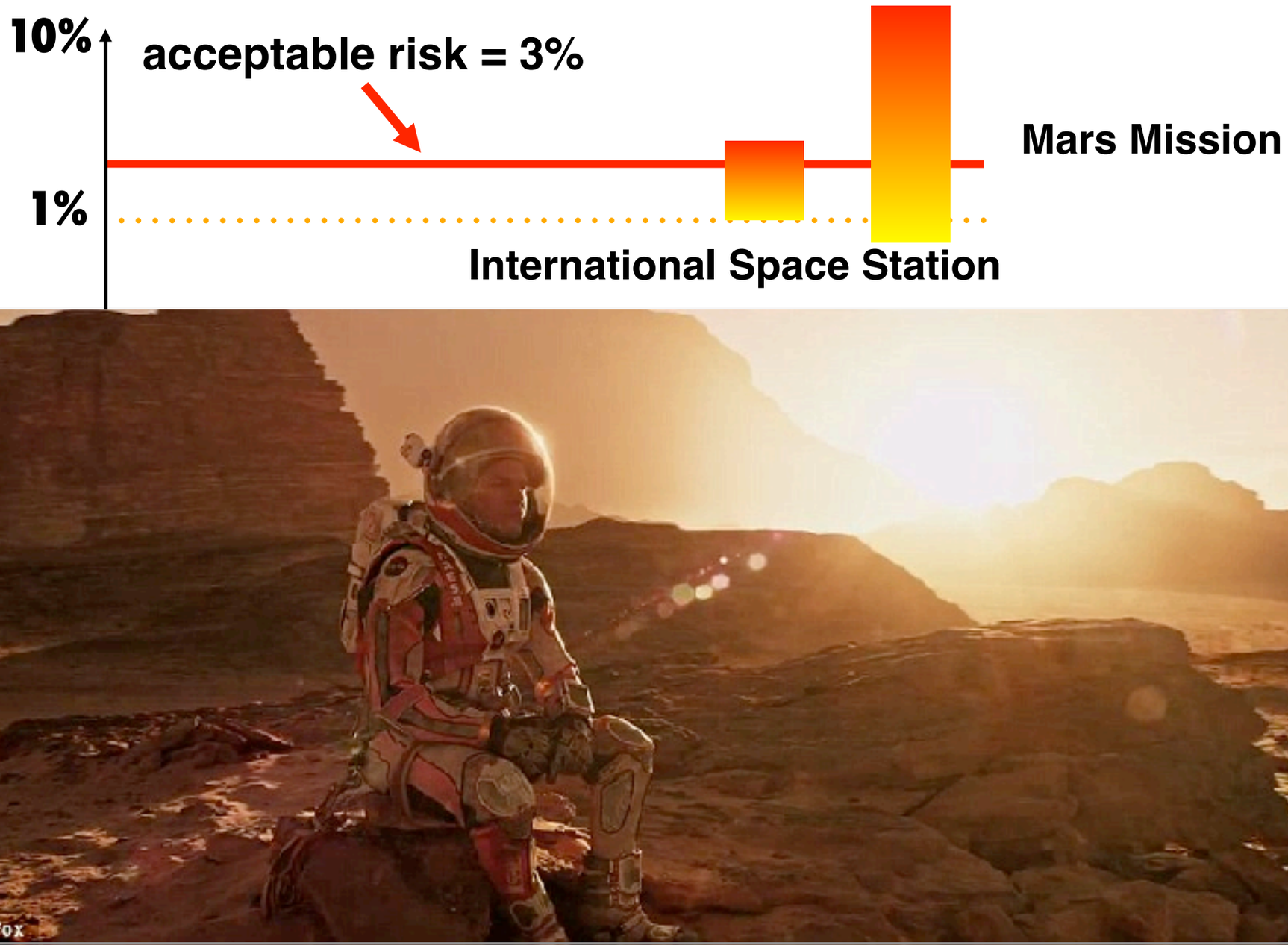

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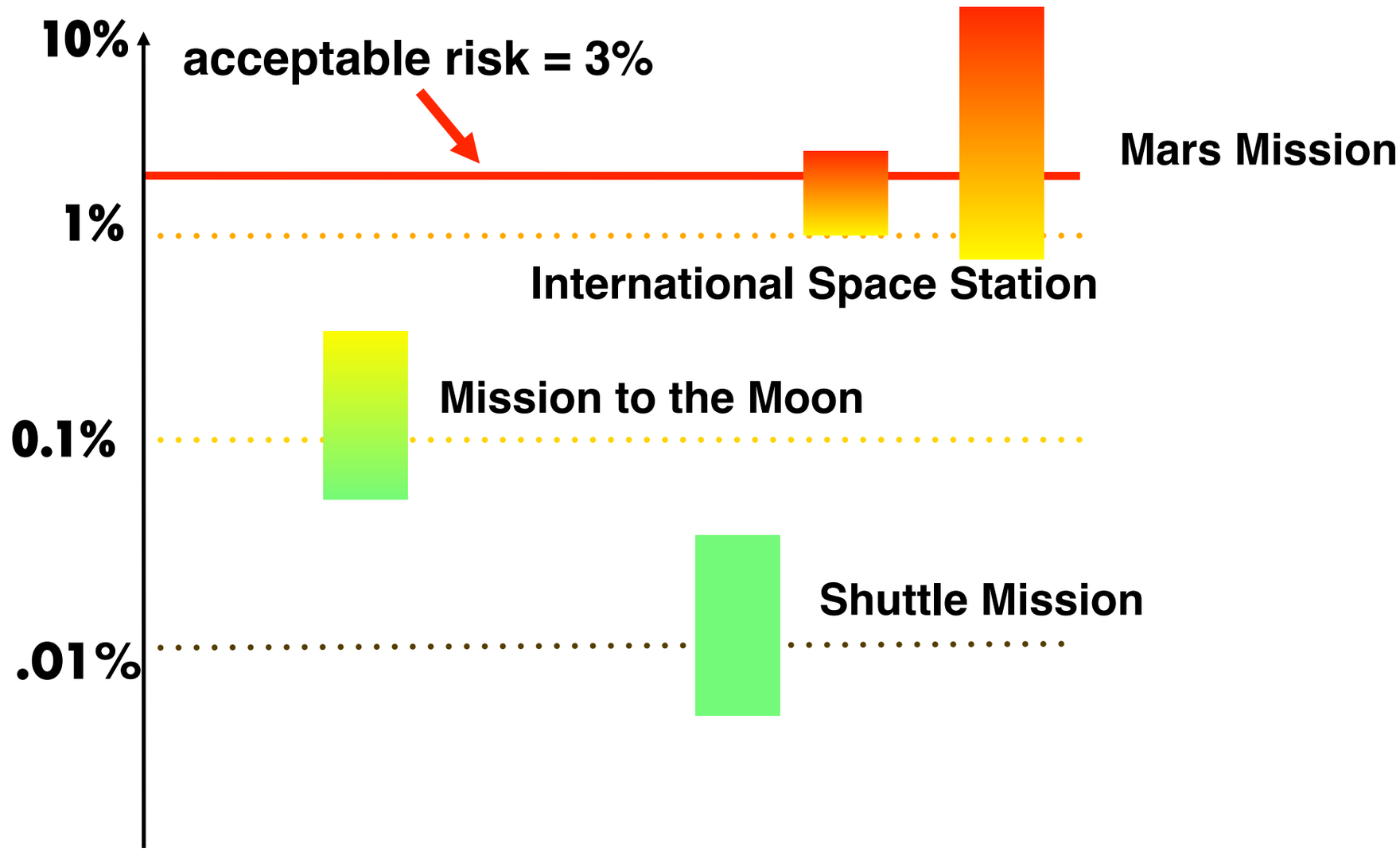

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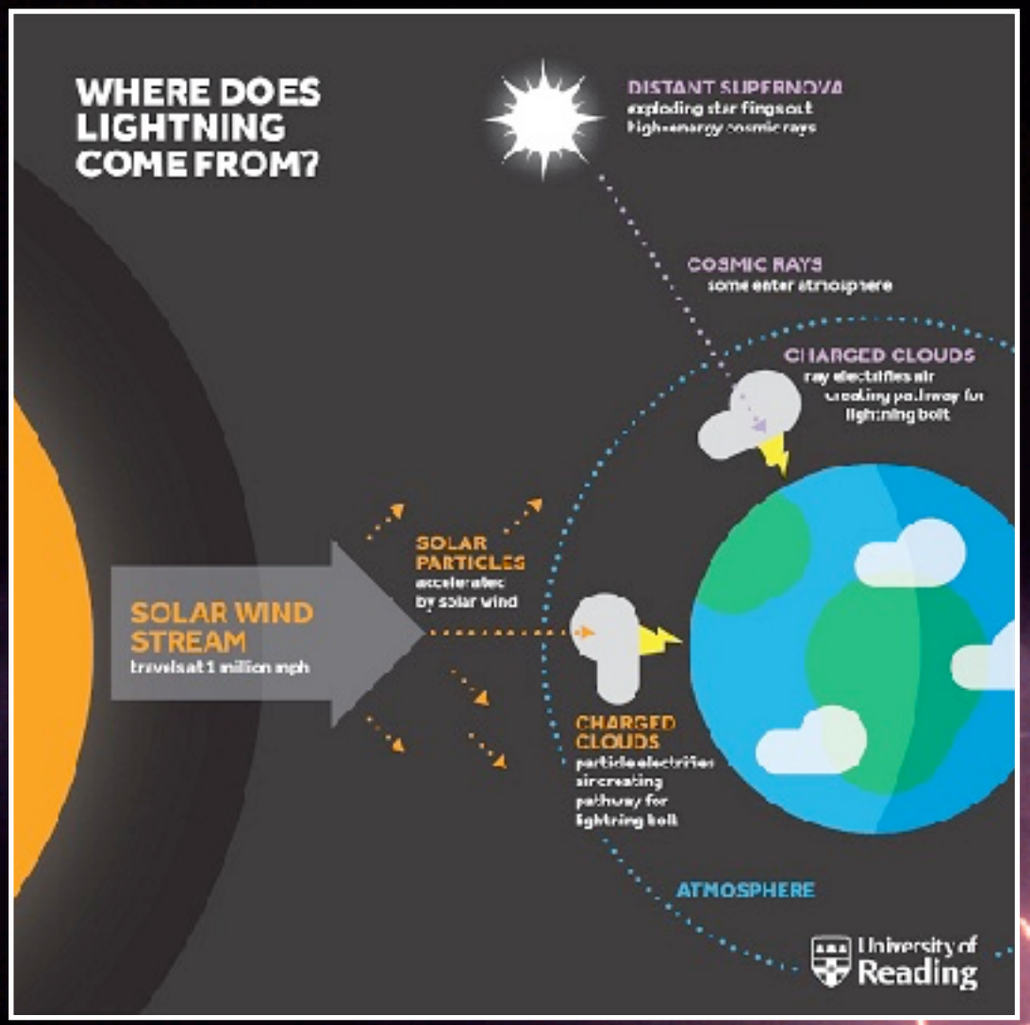

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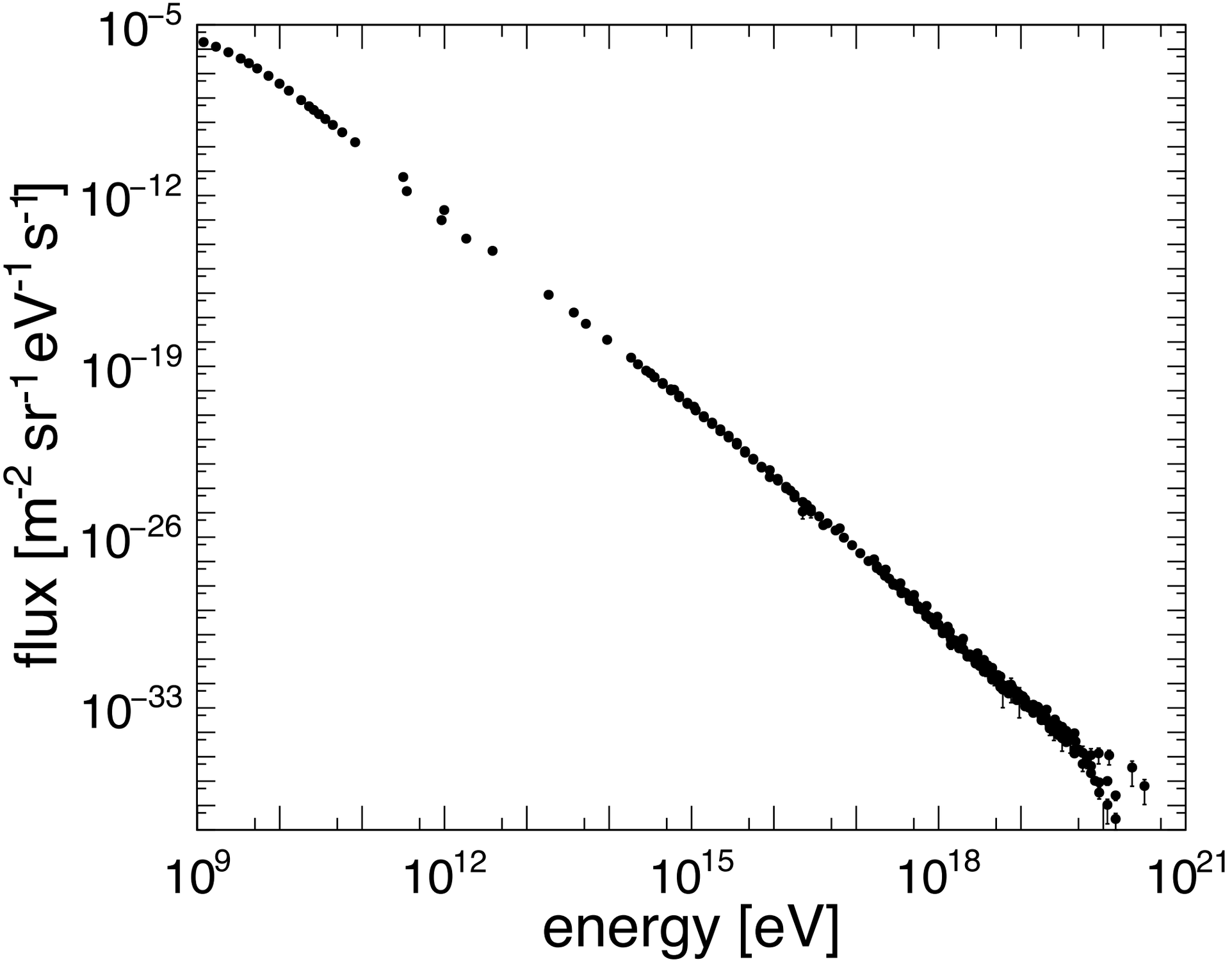

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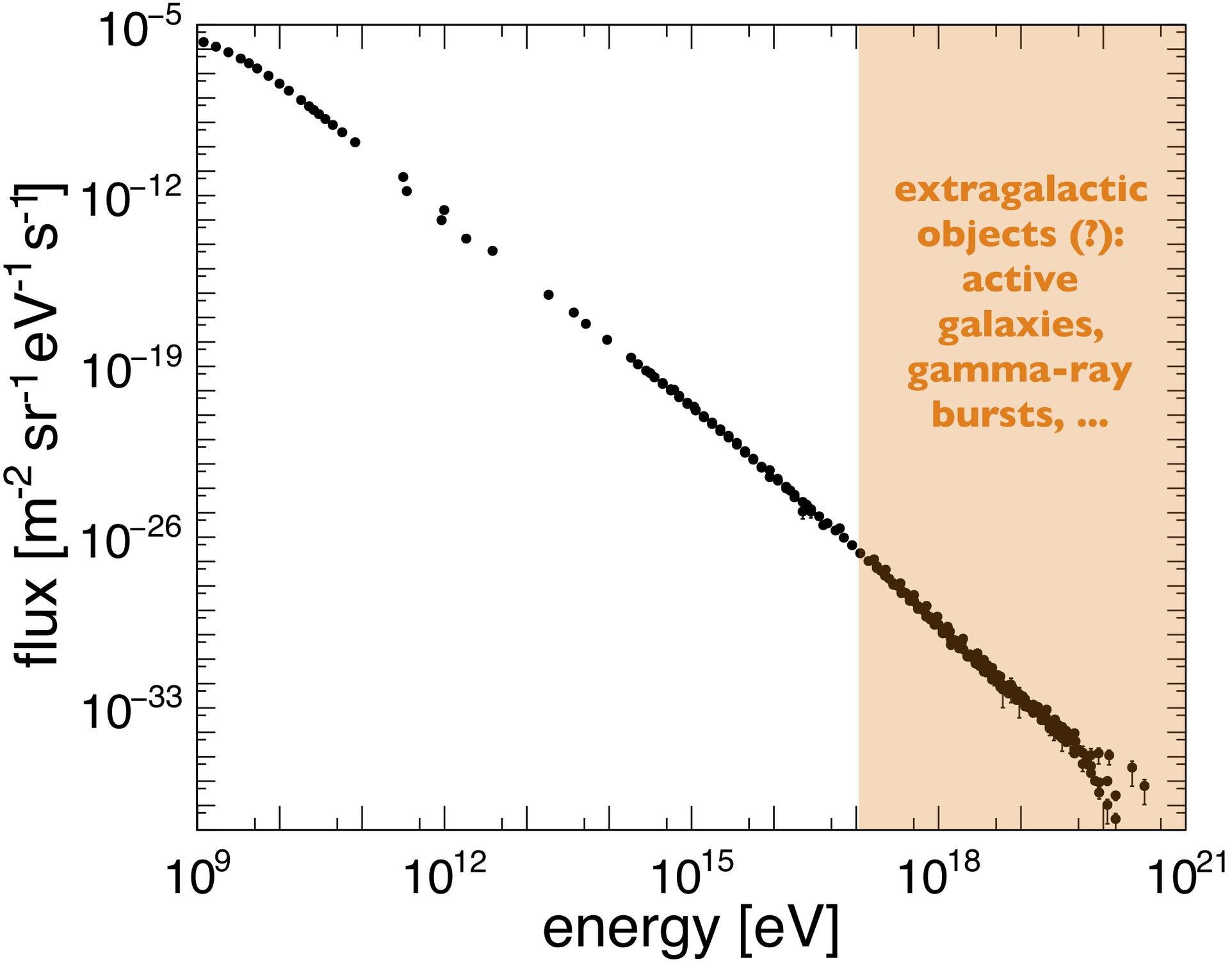

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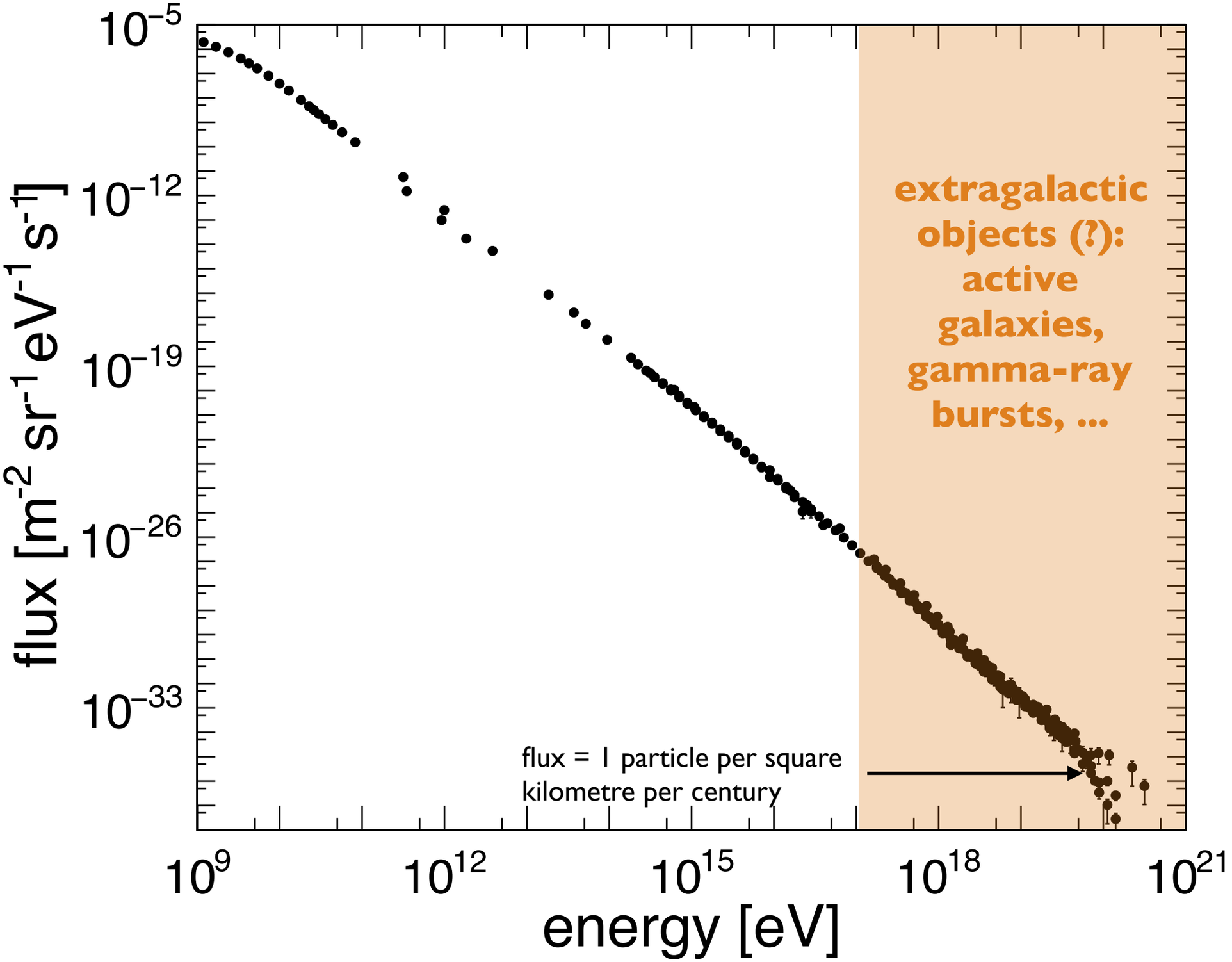

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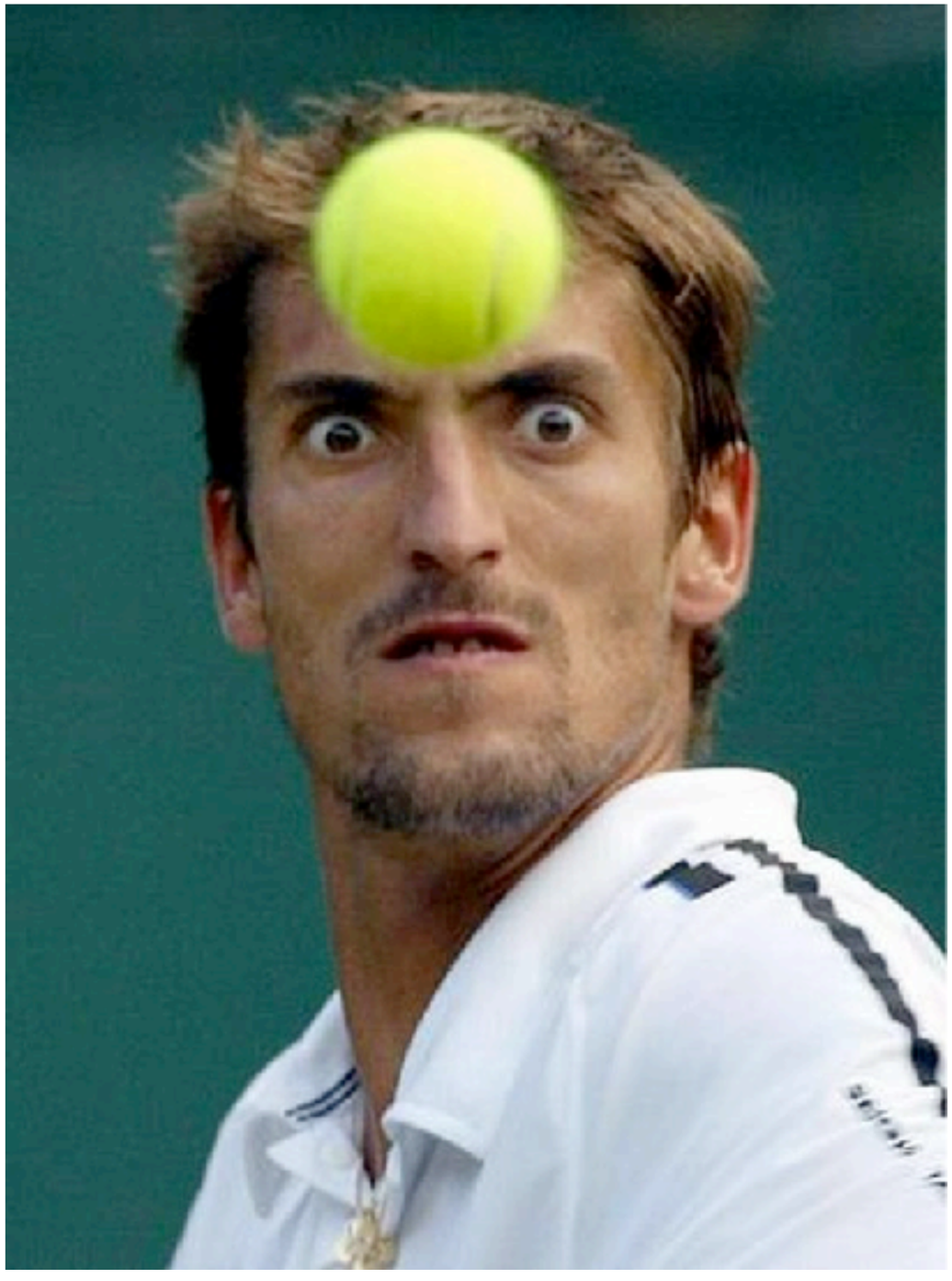

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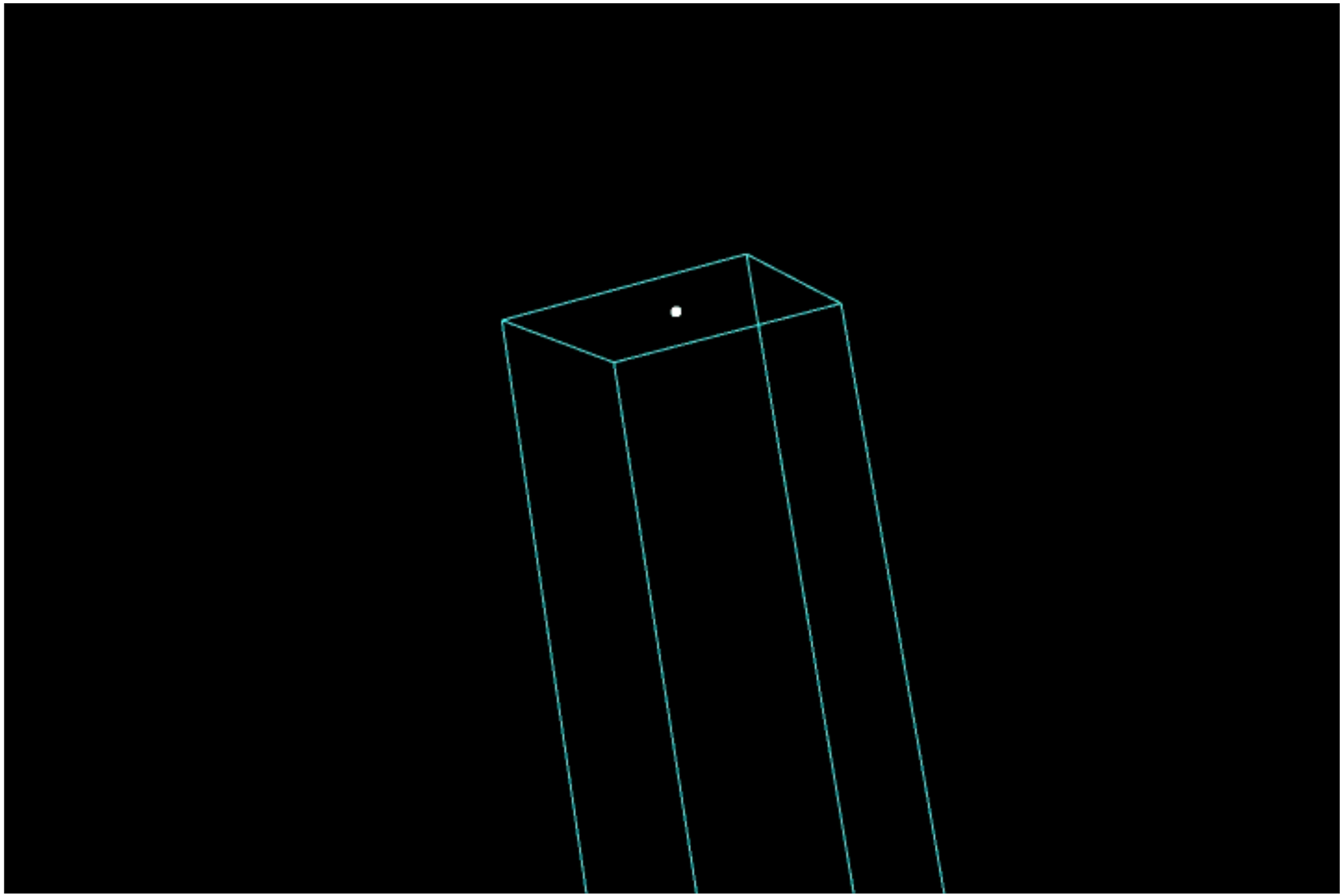
- 60 grams of UHECR have the energy of 10,000,000,000 (10 billion) atomic bombs

cosmic-ray showers



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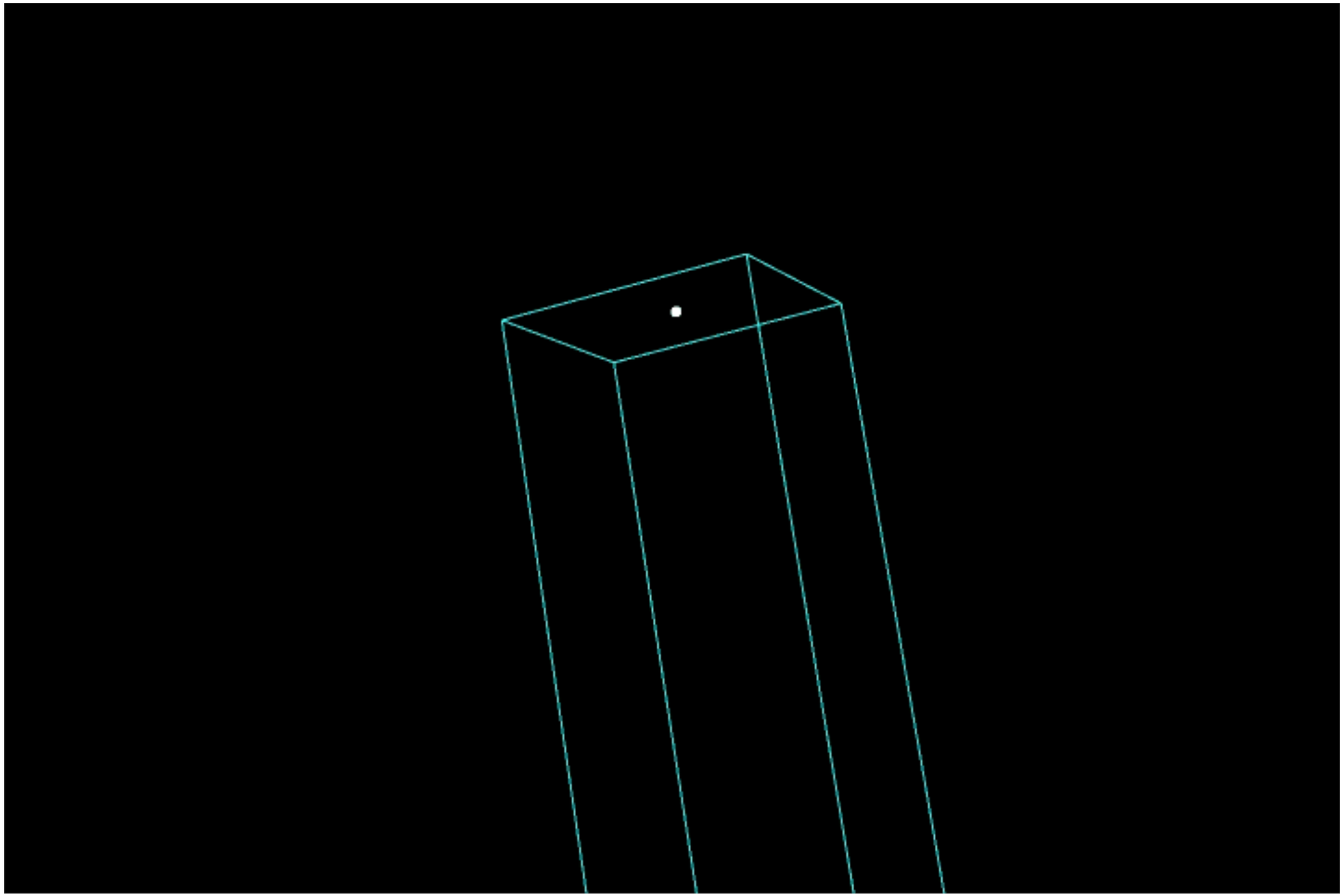

detecting ultra-high-energy cosmic rays

image credits: ASPERA/Novapix/L. Bret

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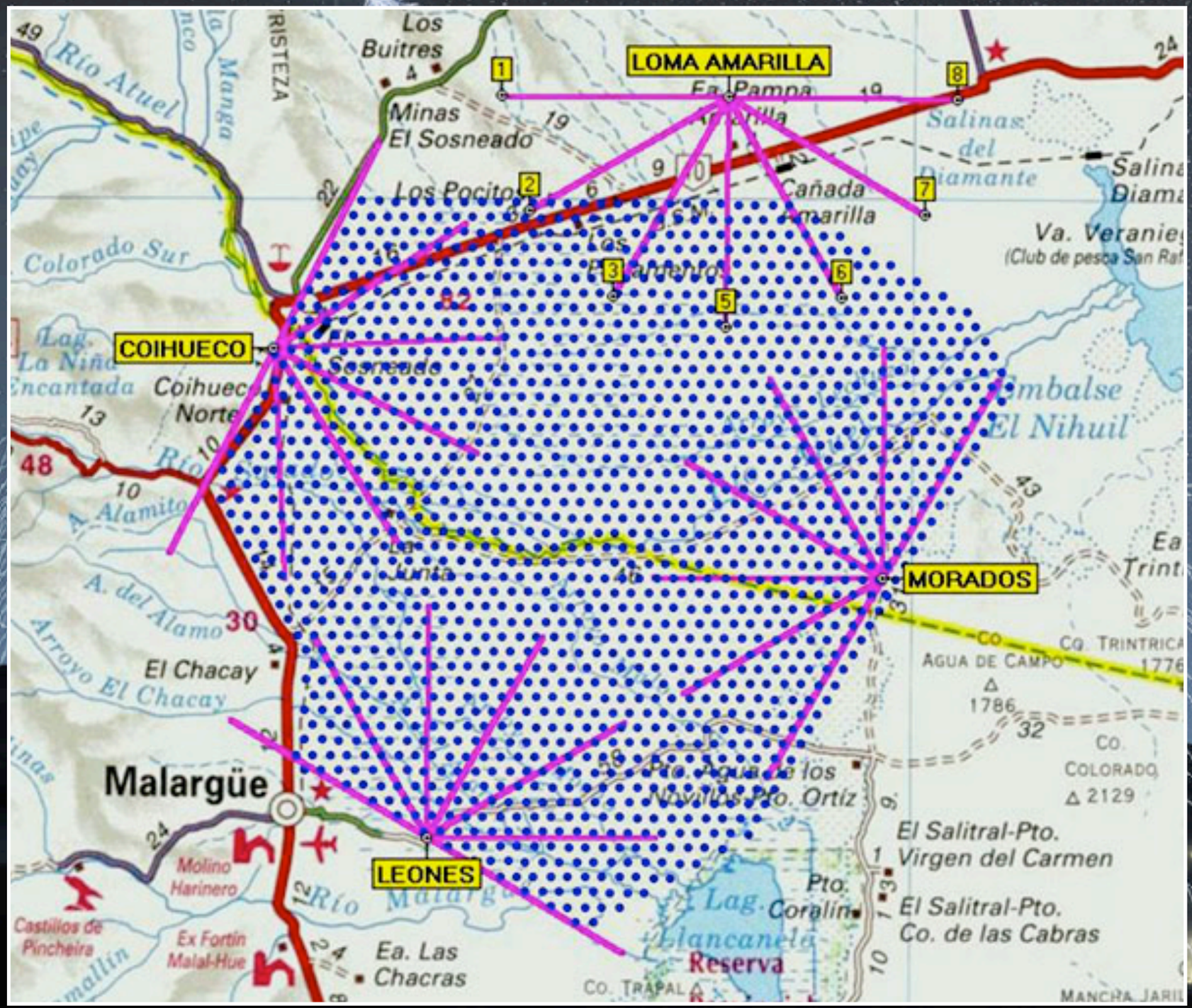
Pierre Auger Observatory, Argentina



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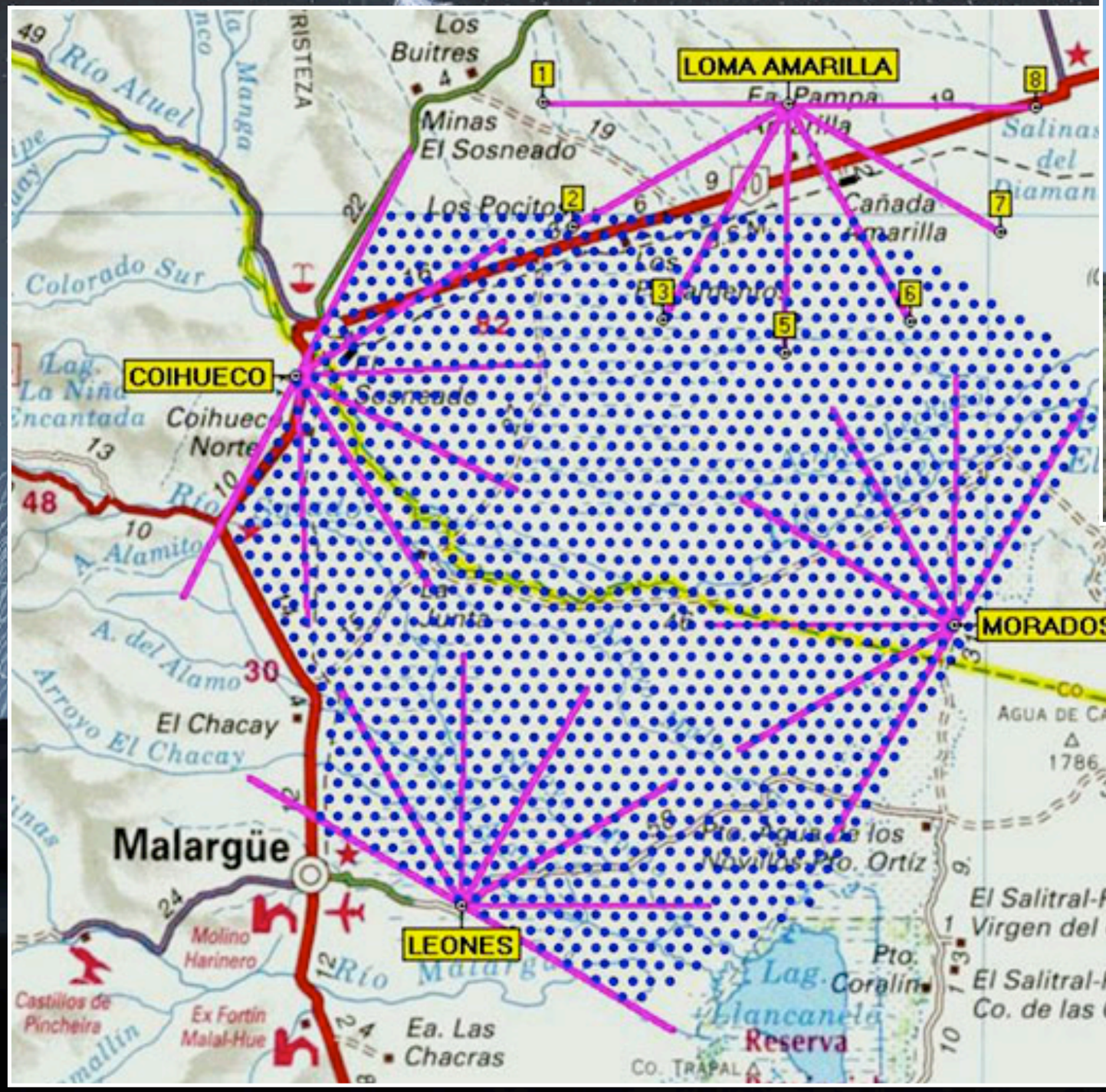

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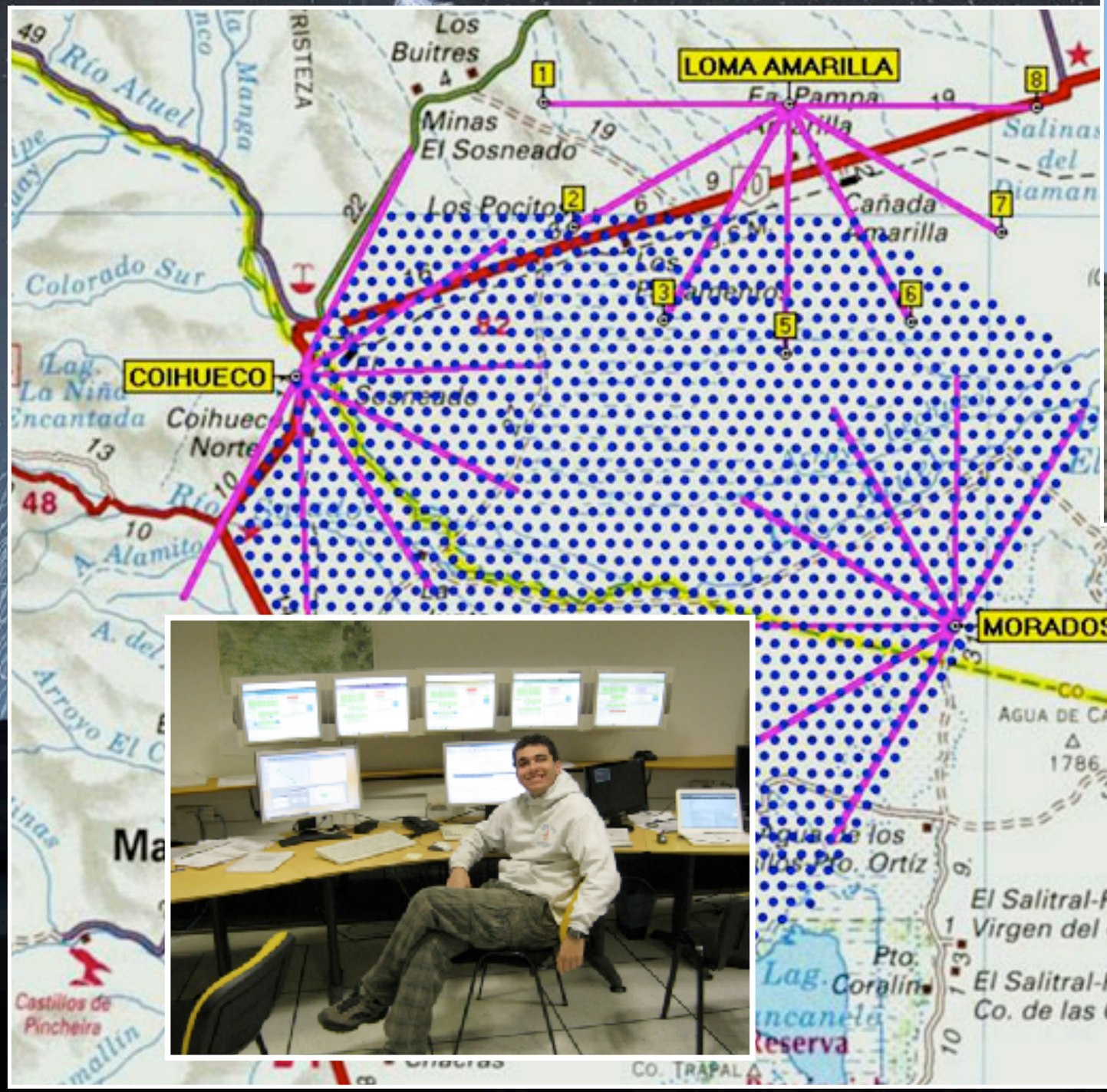

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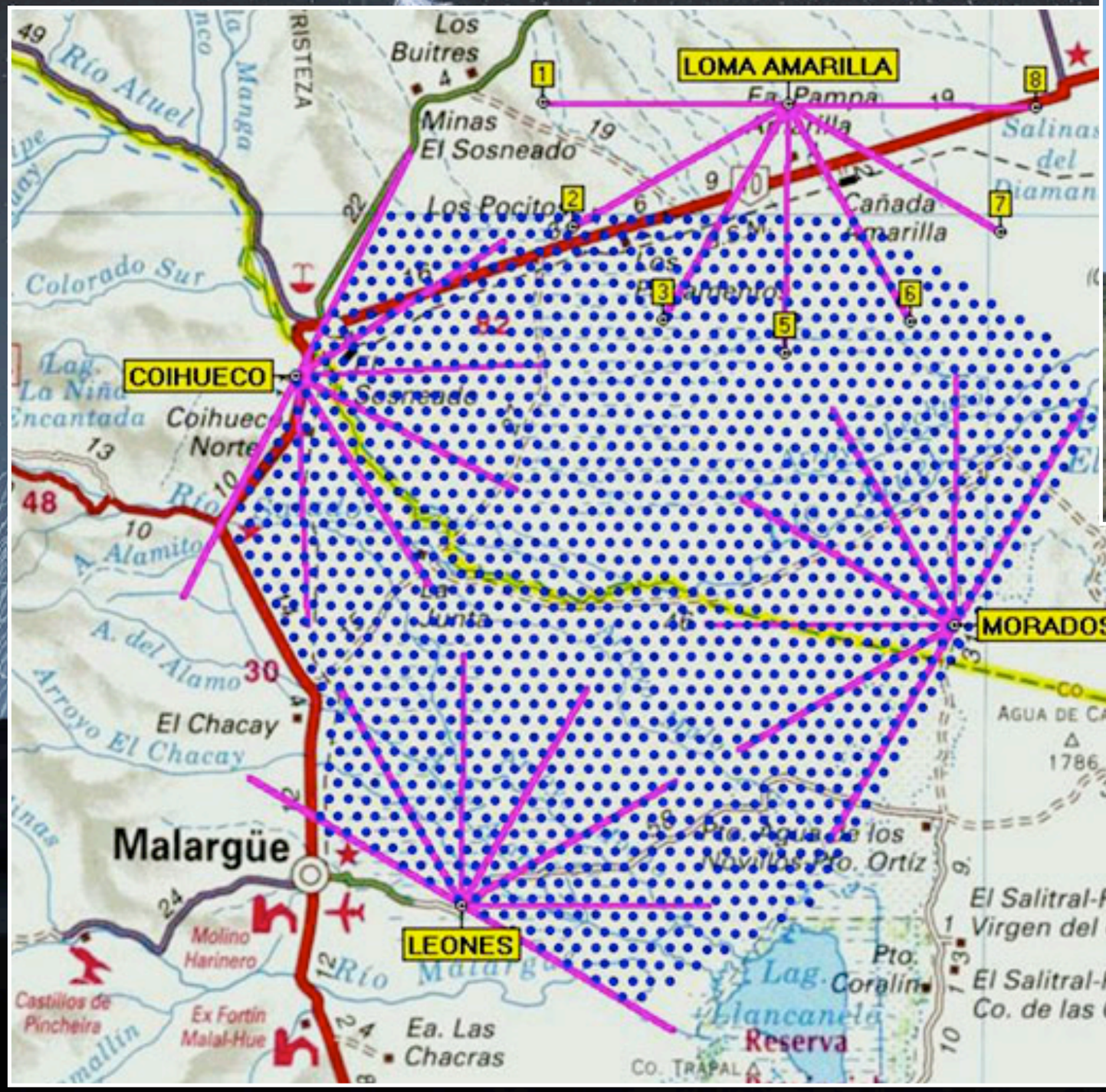

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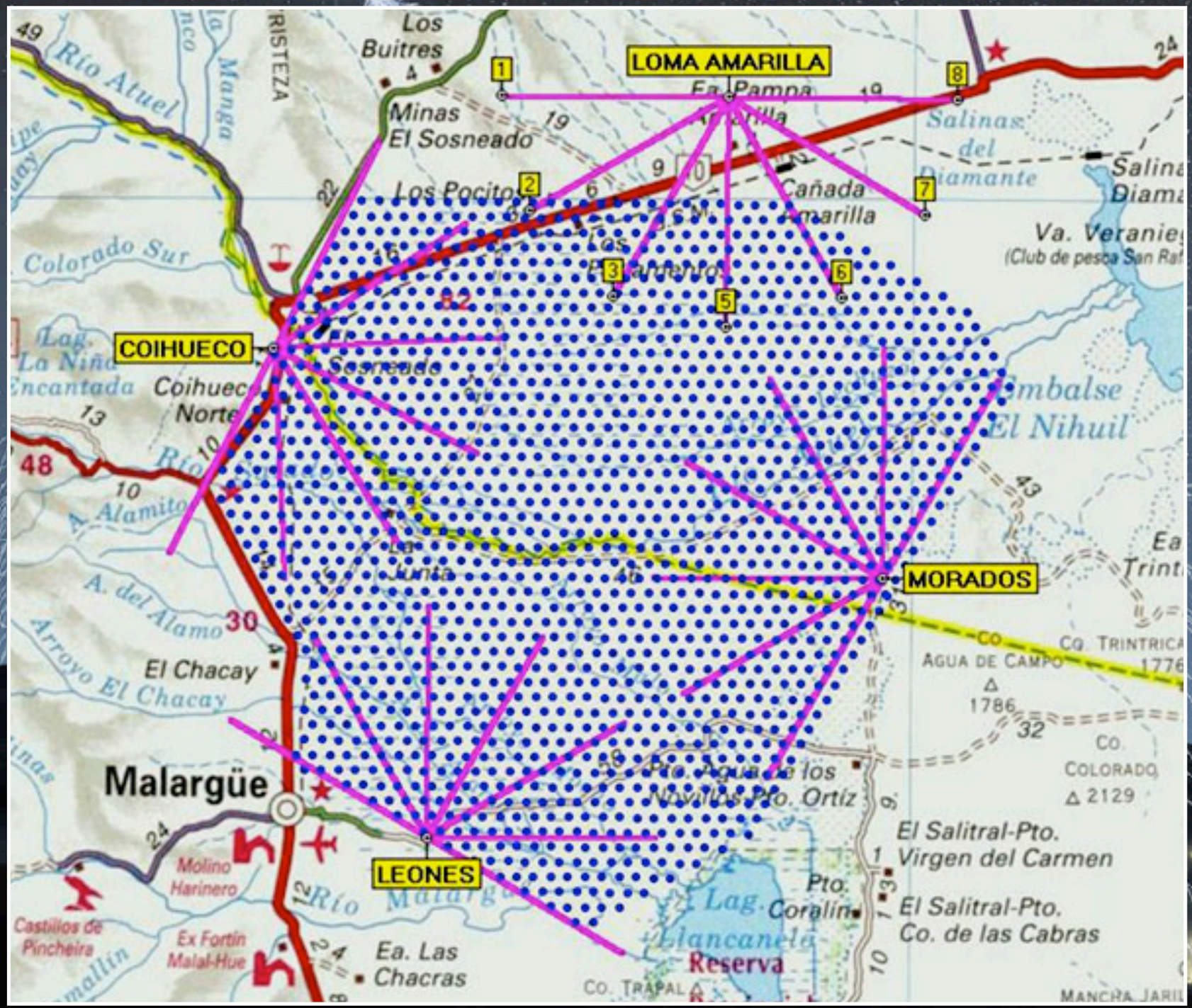

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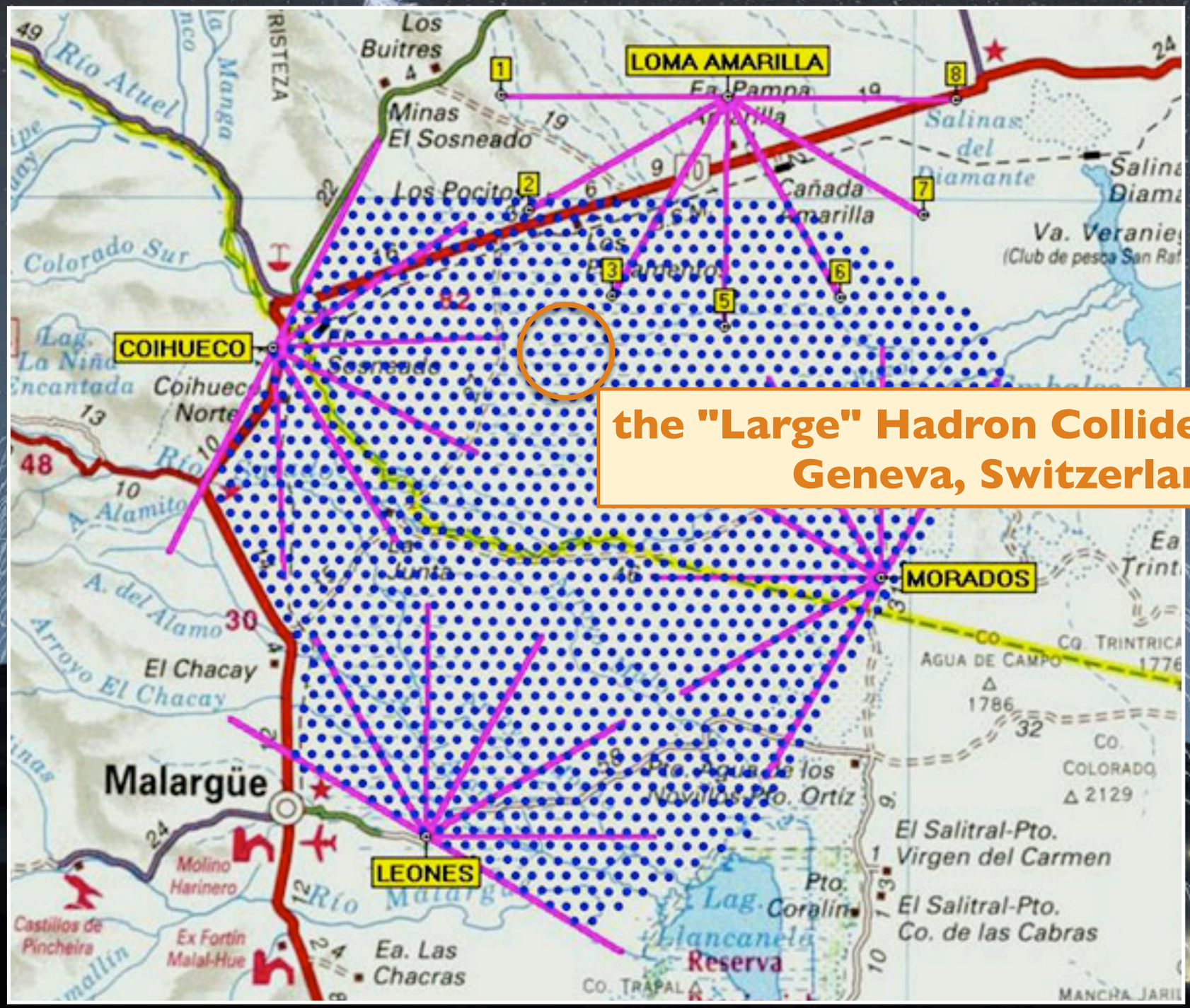

the "Large" Hadron Collider (LHC) in Geneva, Switzerland

image credits: ASPERA/Novapix/L. Bret

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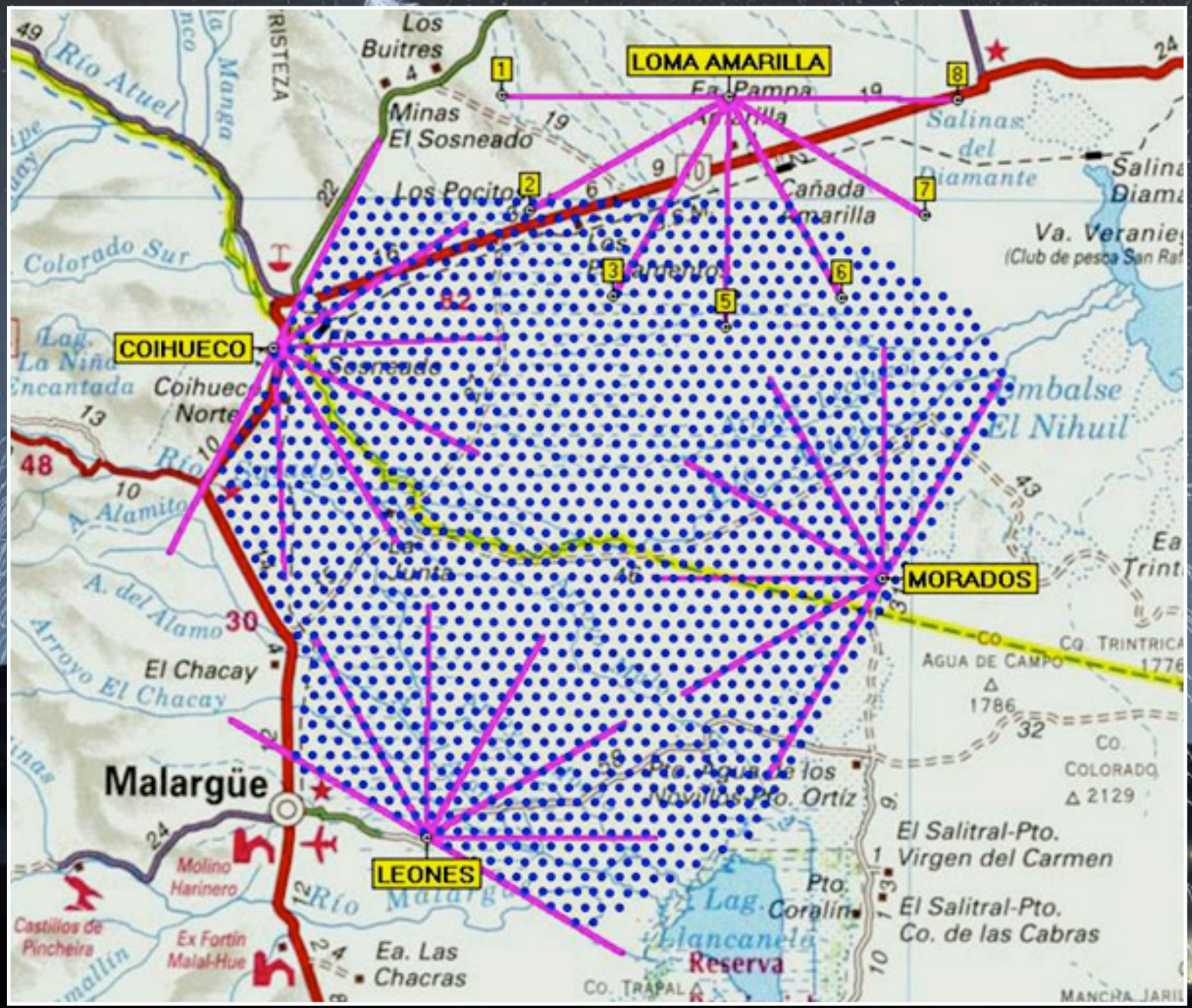

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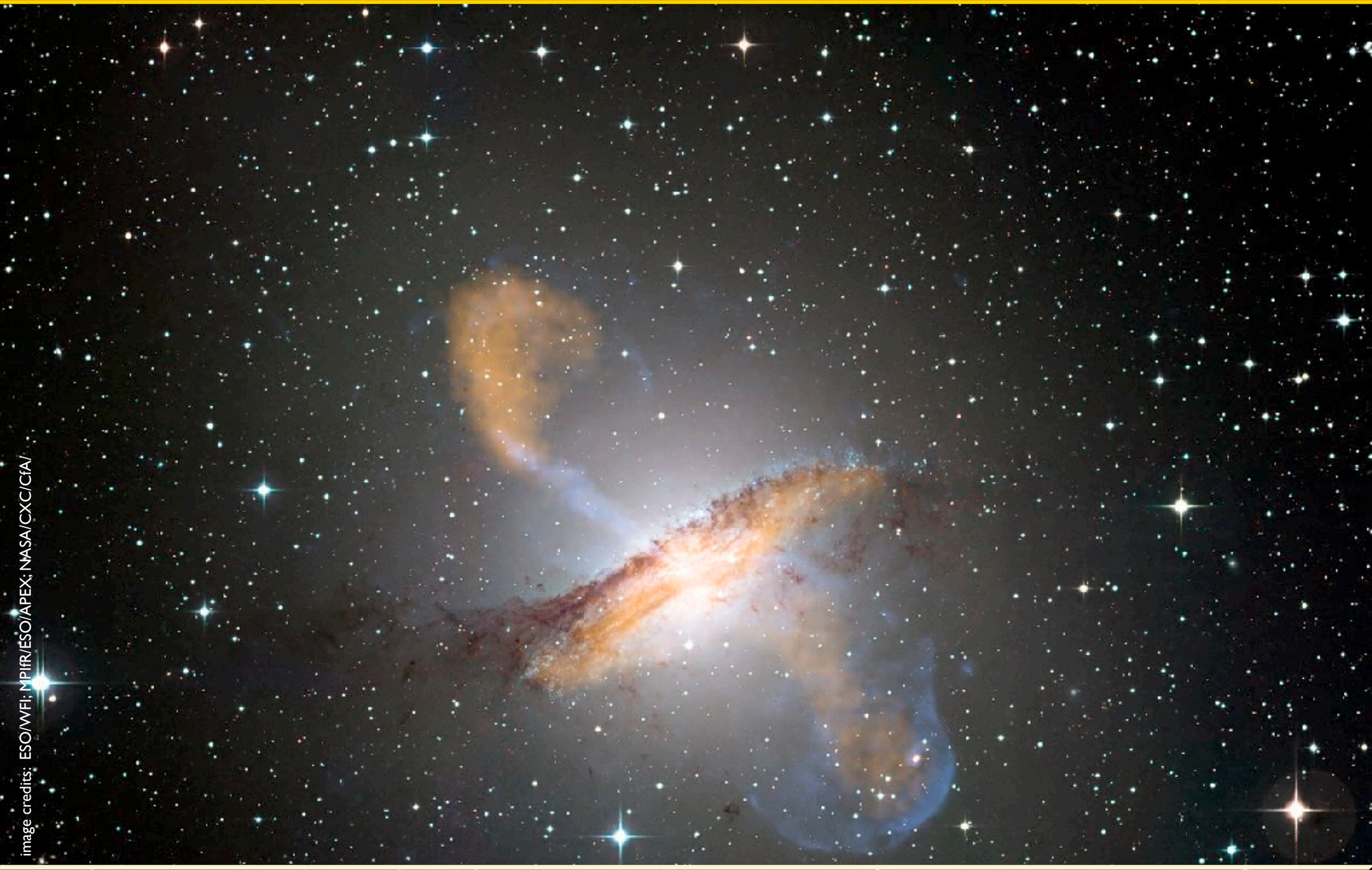

image credits: ESO/WFI; MPIfR/ESO/APEX; NASA/CXC/CfA/

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- they may be a hazard in space missions
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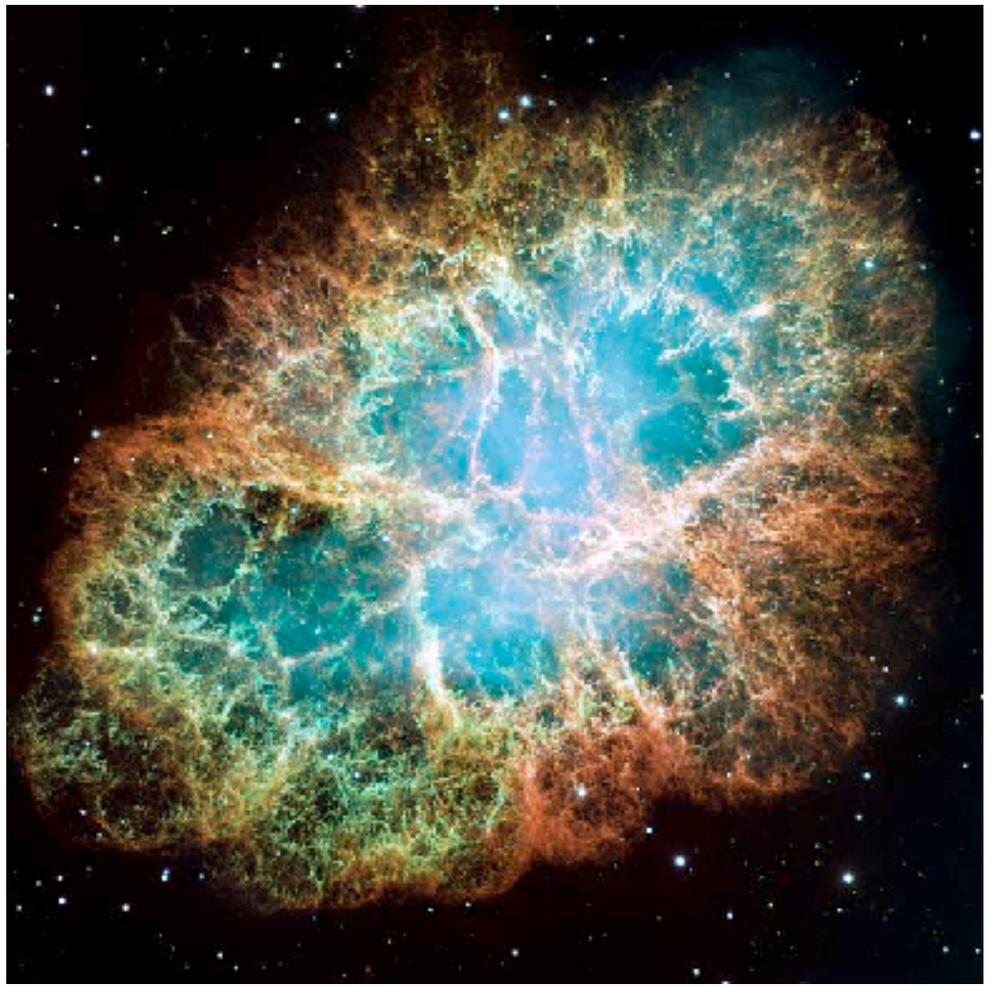
questions??

backup slides

supernovae



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galactic cosmic rays

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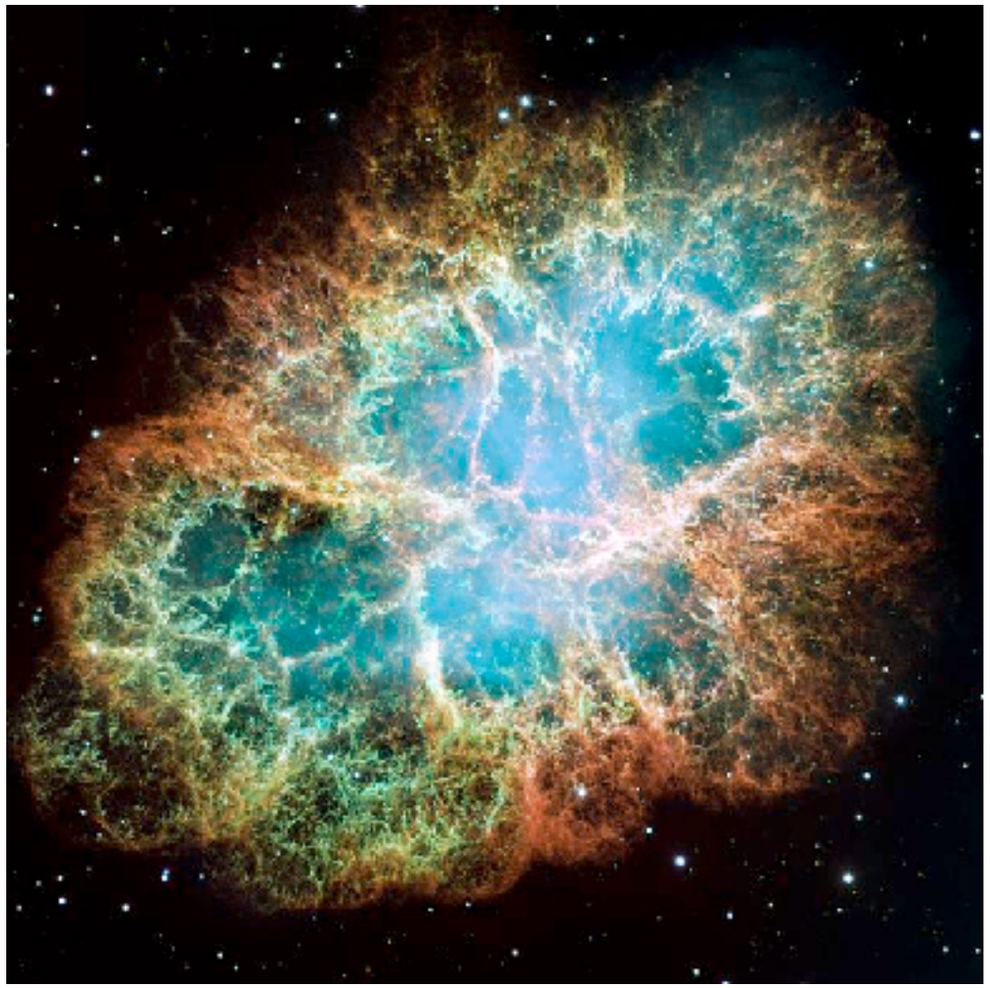

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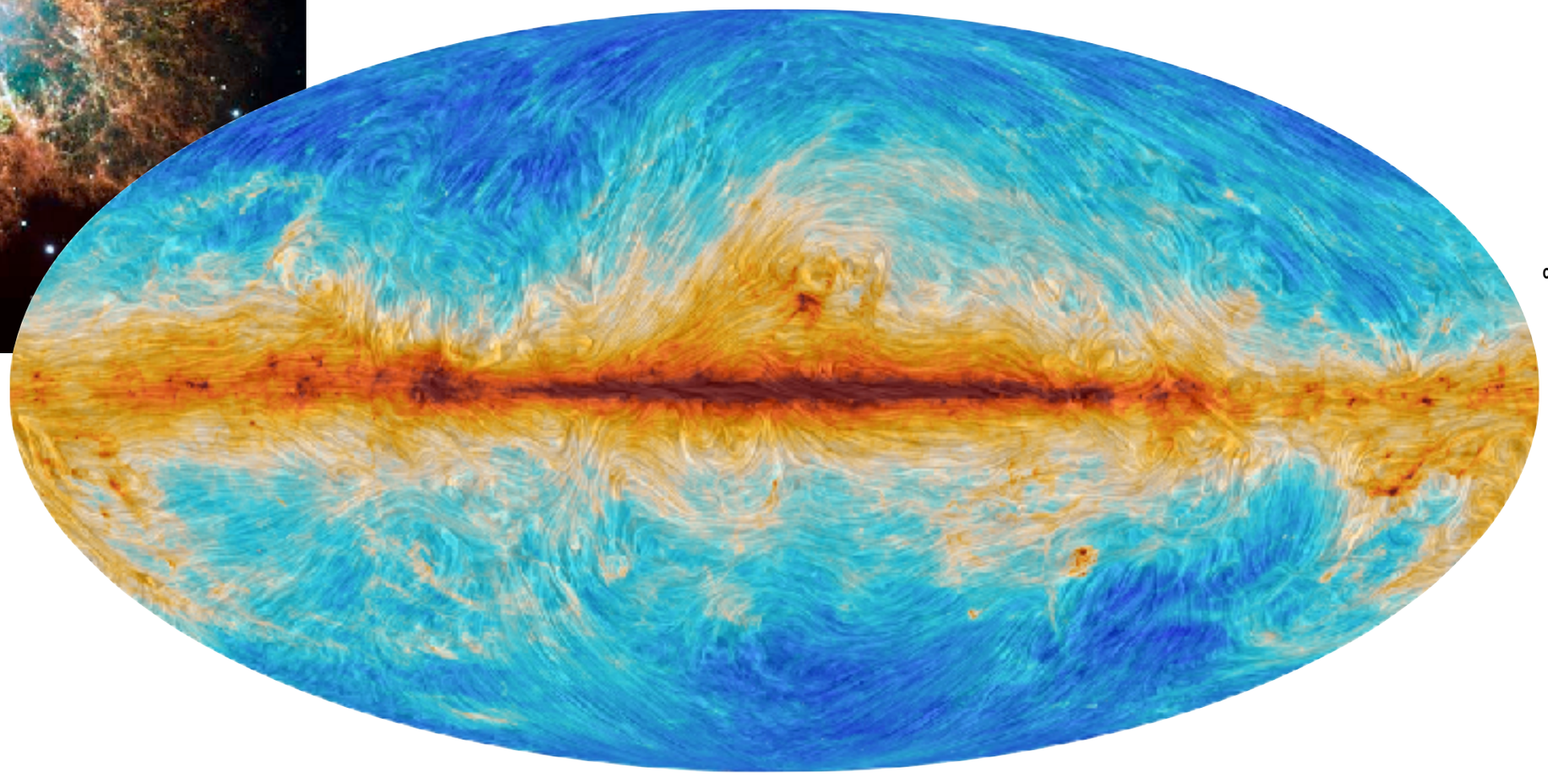

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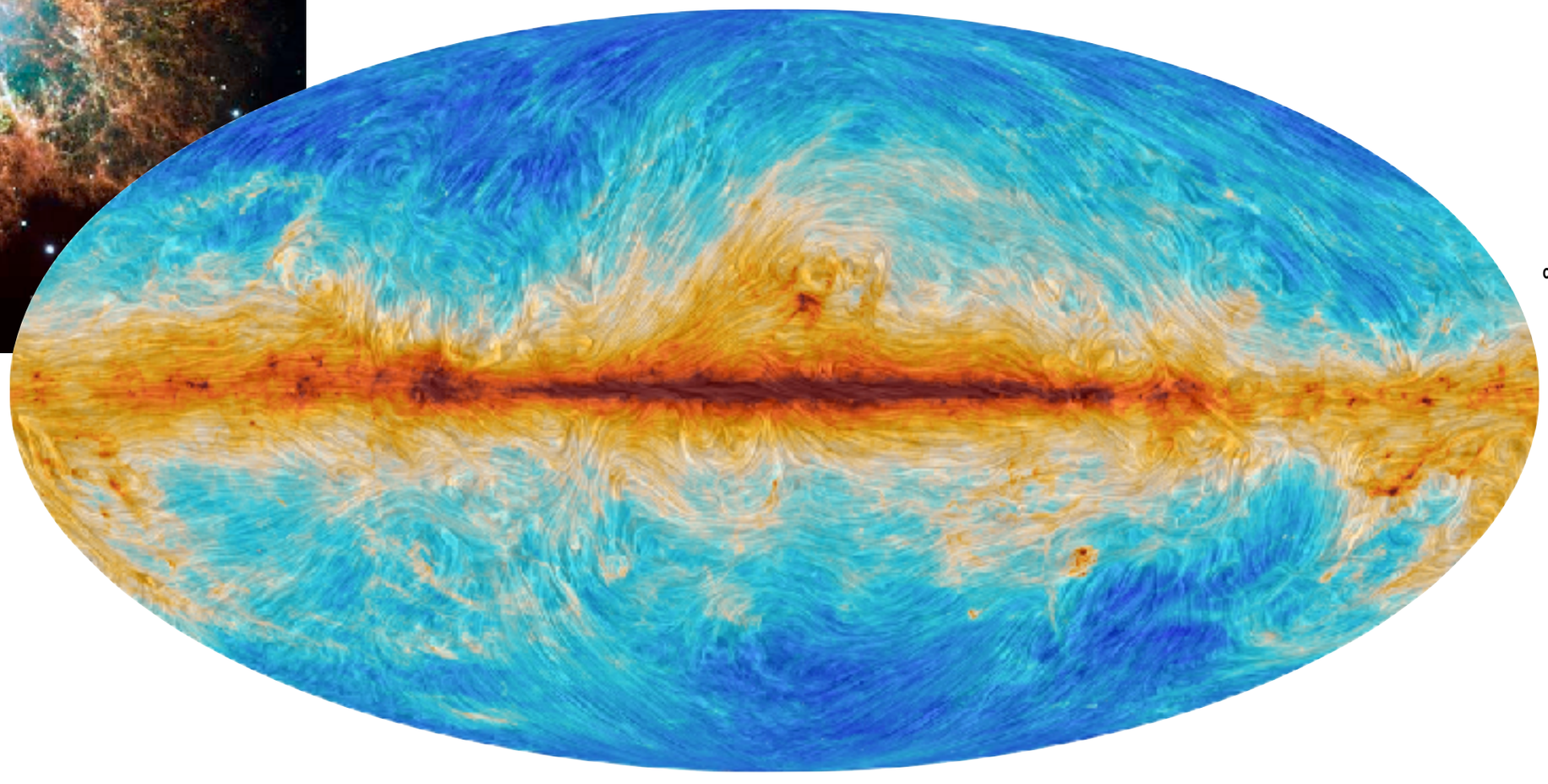

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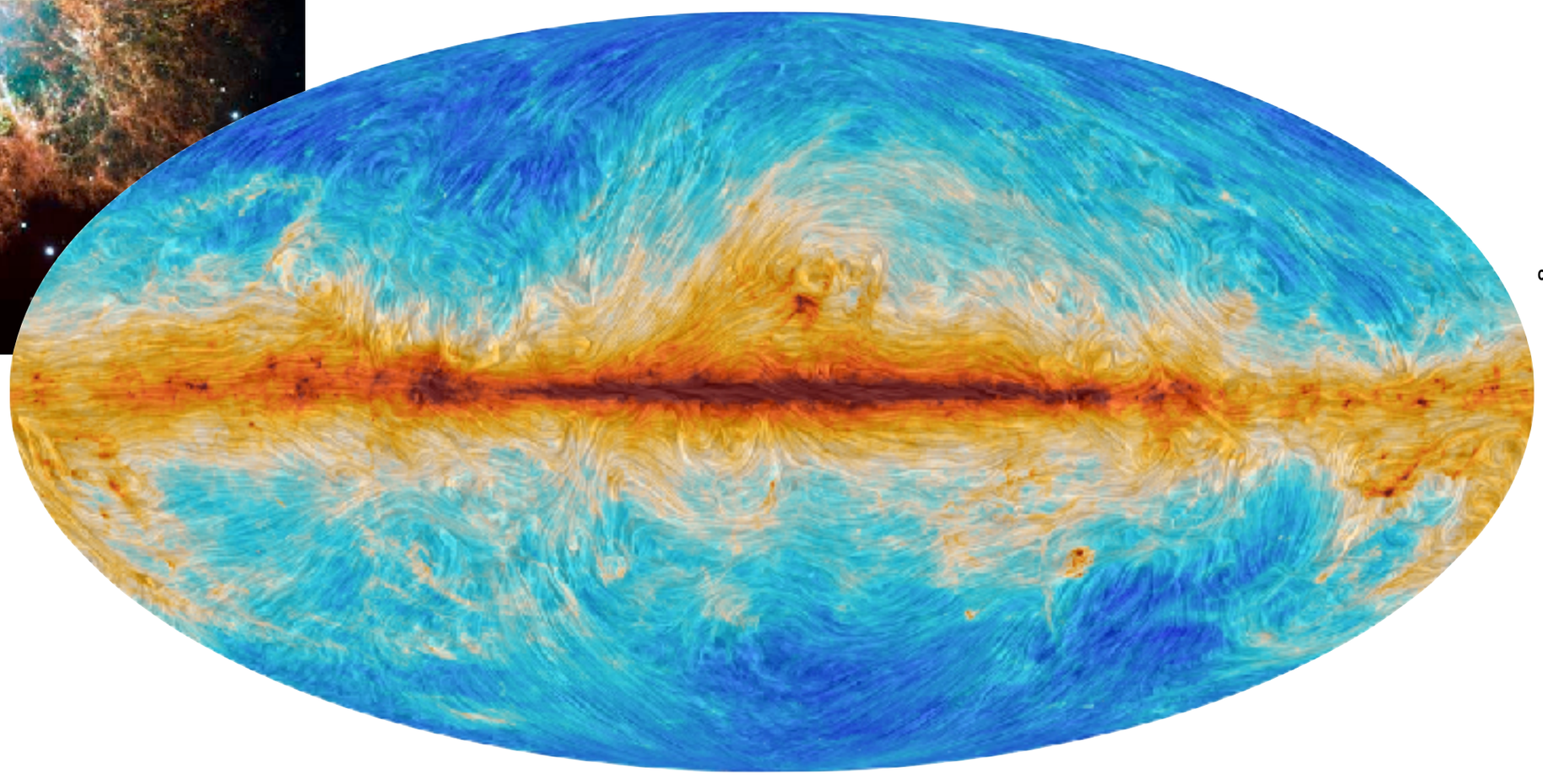
- suitable method: look at the gamma rays (cosmic rays interact with stuff around their source, producing gamma rays)



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