



university of
groningen

faculty of science
and engineering

The Art of Simplification: The Role of Animations in Physics Education

STEM Symposium

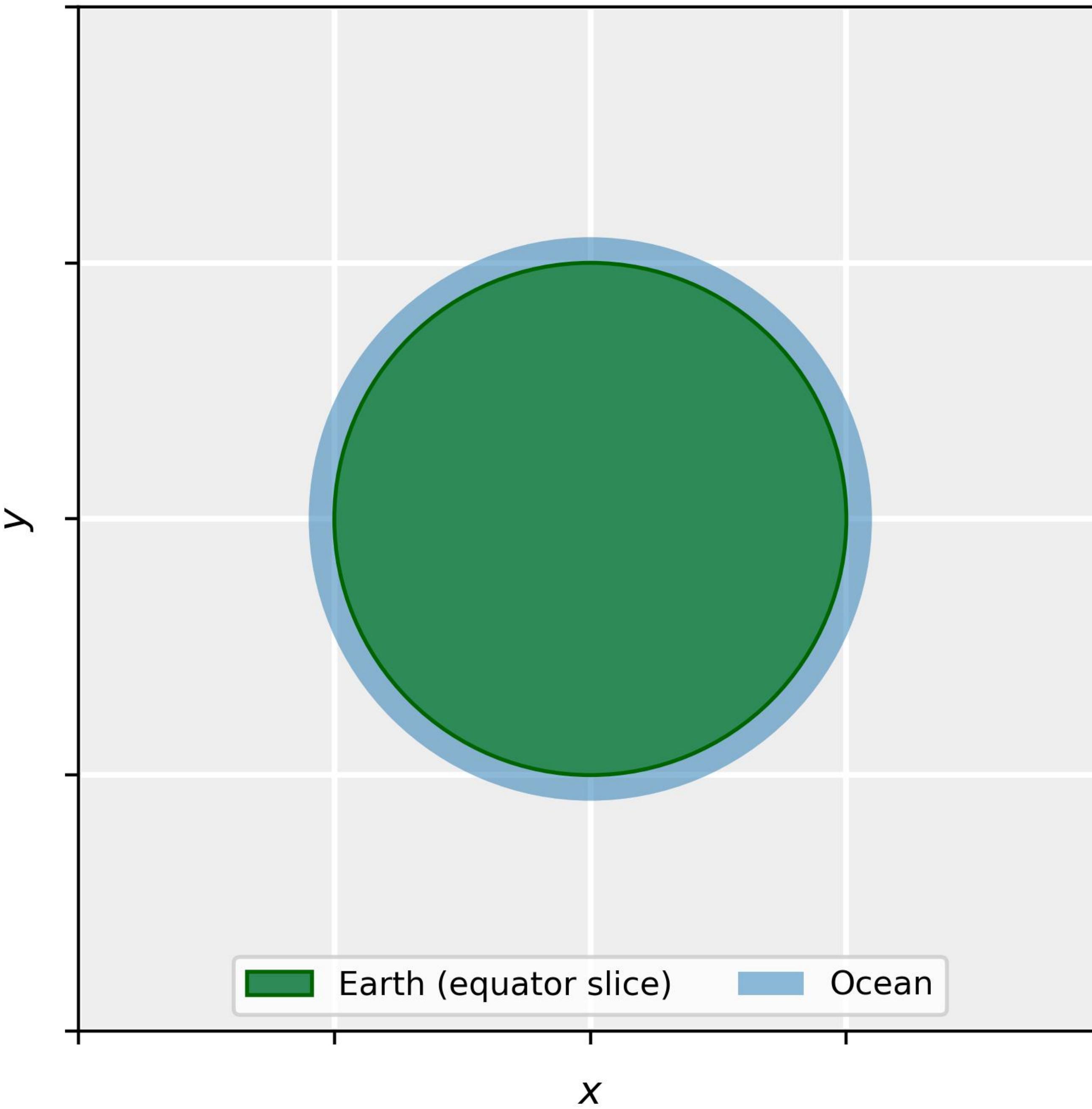
Why use Animations?

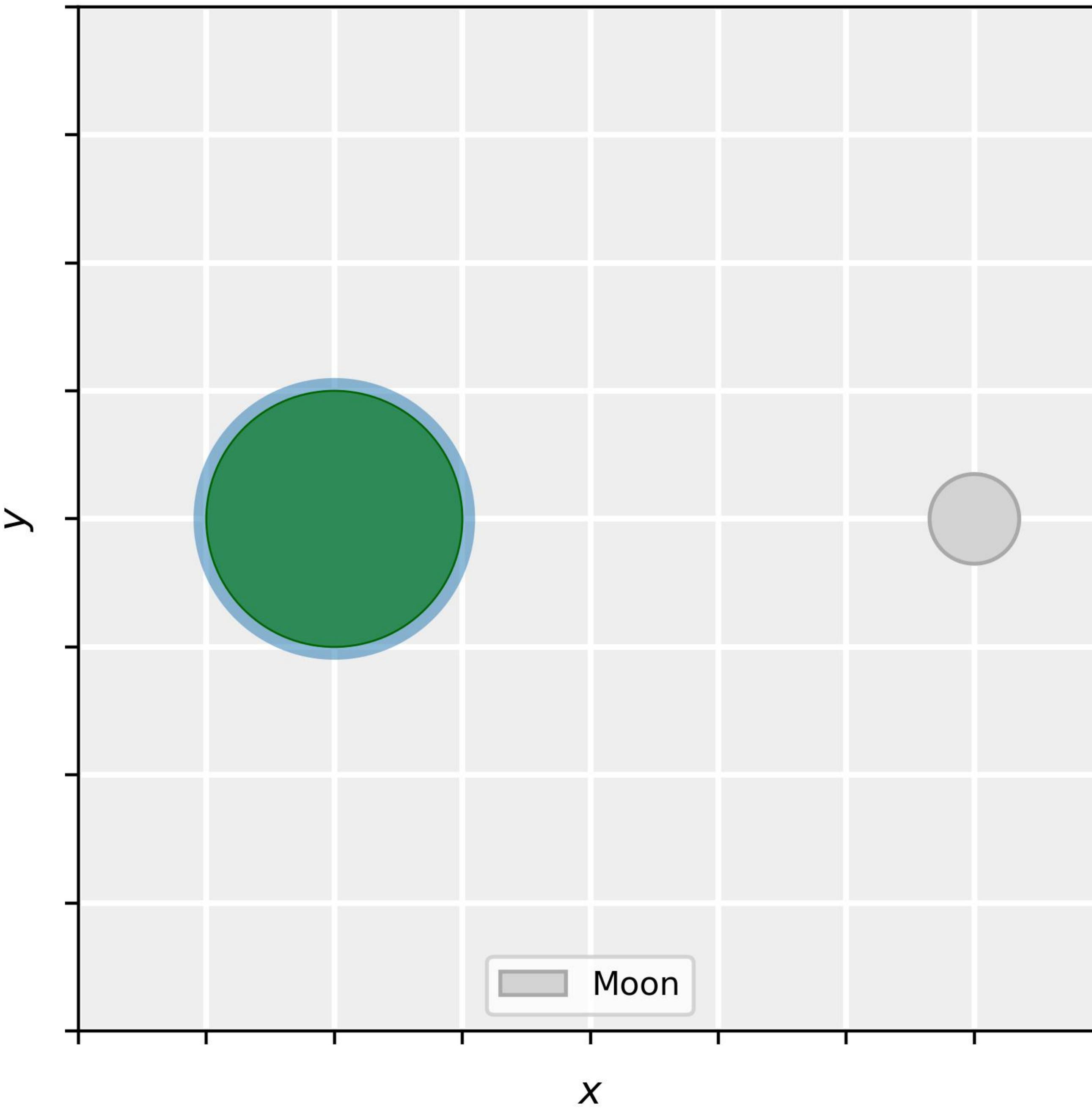
- **Animations** have the power to get to the **core physical understanding** of a (difficult) concept or problem, by:
 - Forcing students to **visualize the problem** in a dynamic way;*
 - Implementing ('hiding') **mathematics** 'inside' the animation, **not distracting** the student from grasping the core concept during first introduction;
 - Making simplifying **assumptions** very **explicit**.
- **Warning:** Animations do not *replace* the mathematics, but can serve as an initial handle when solving the problem mathematically.

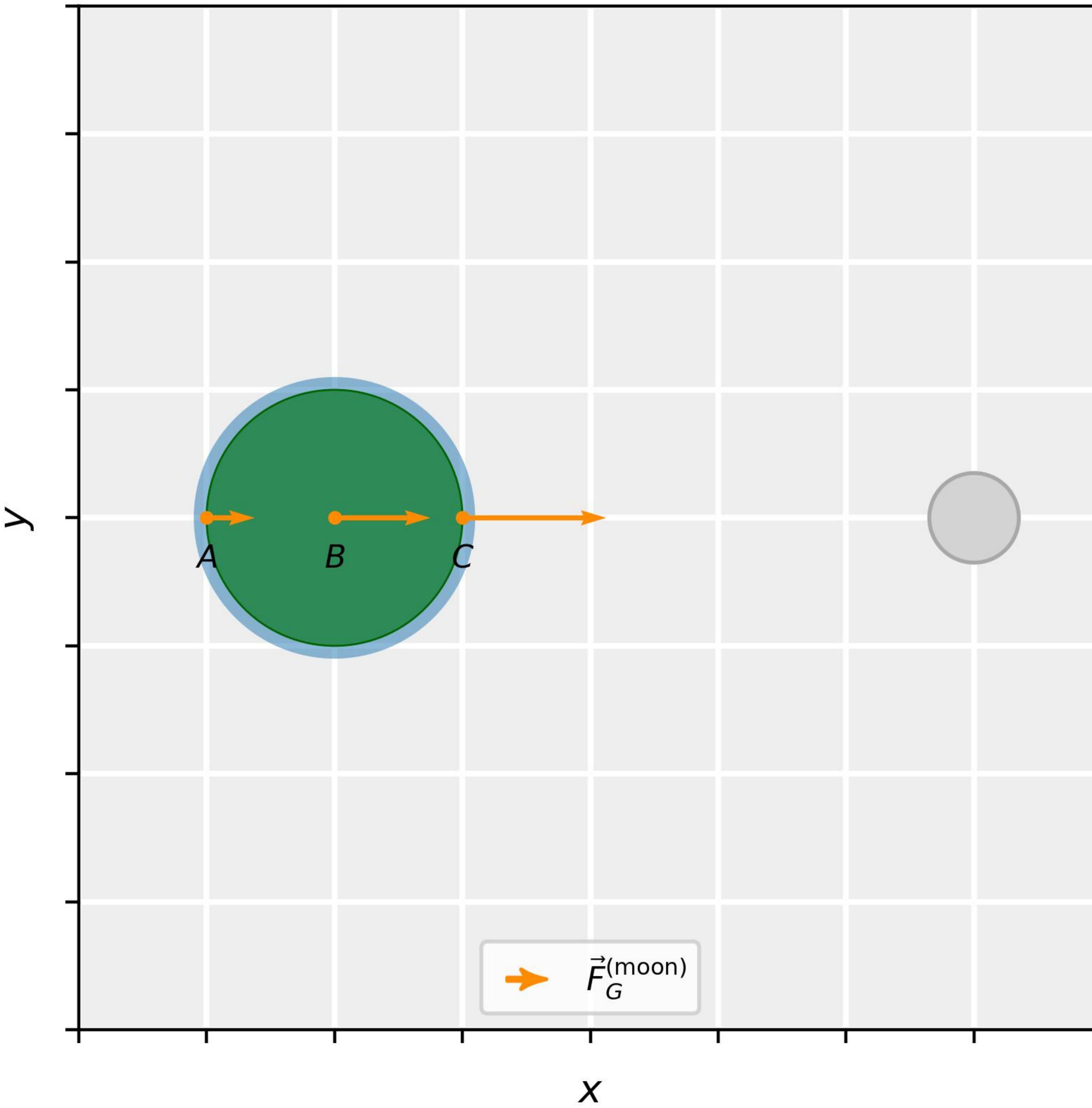
* e.g.: S Van den Eynde, M Goedhart, J Deprez, M De Cock, International Journal of Science and Mathematics Education 21 (1), 25-47

Showcase: Ocean Tides

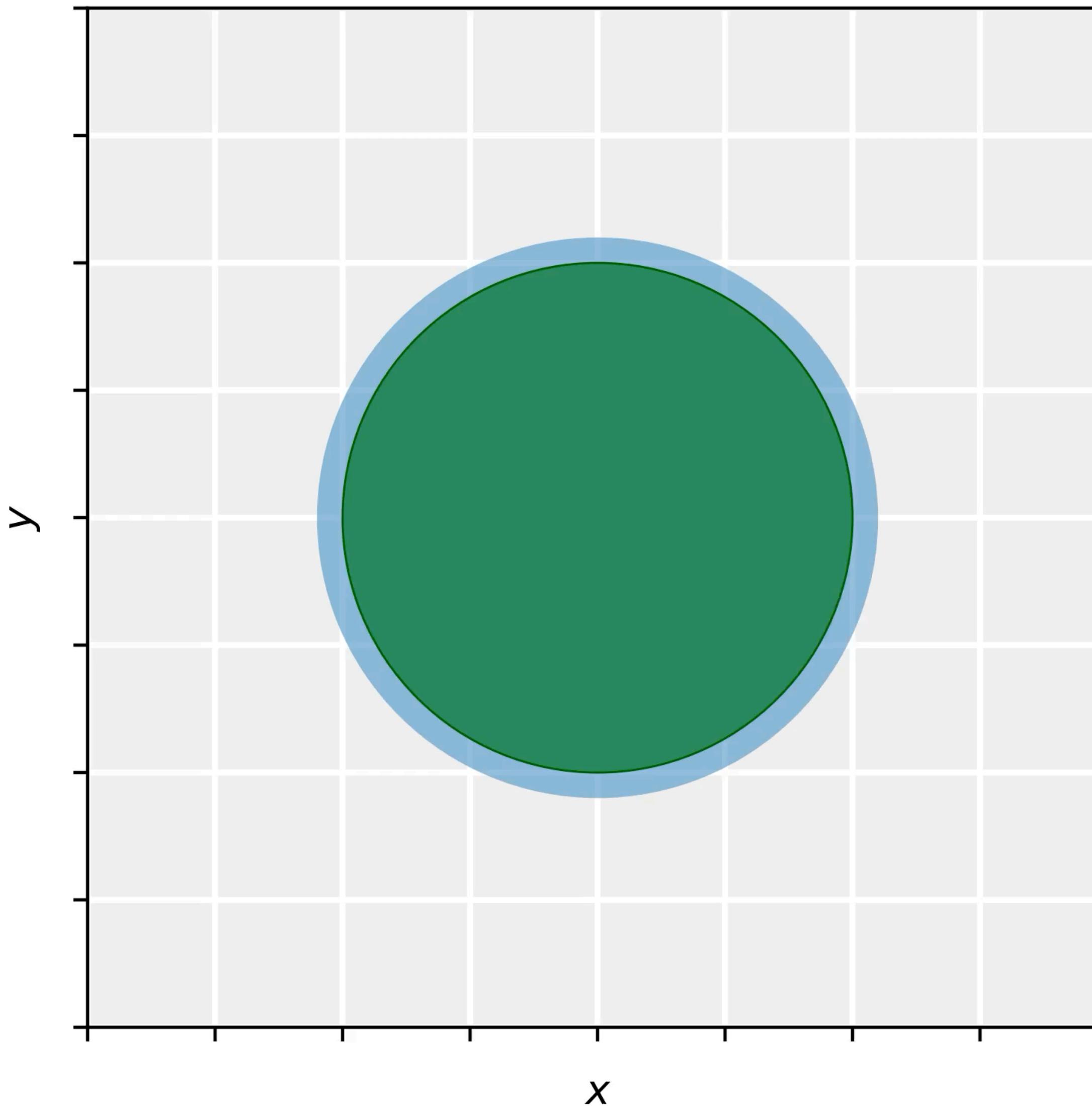




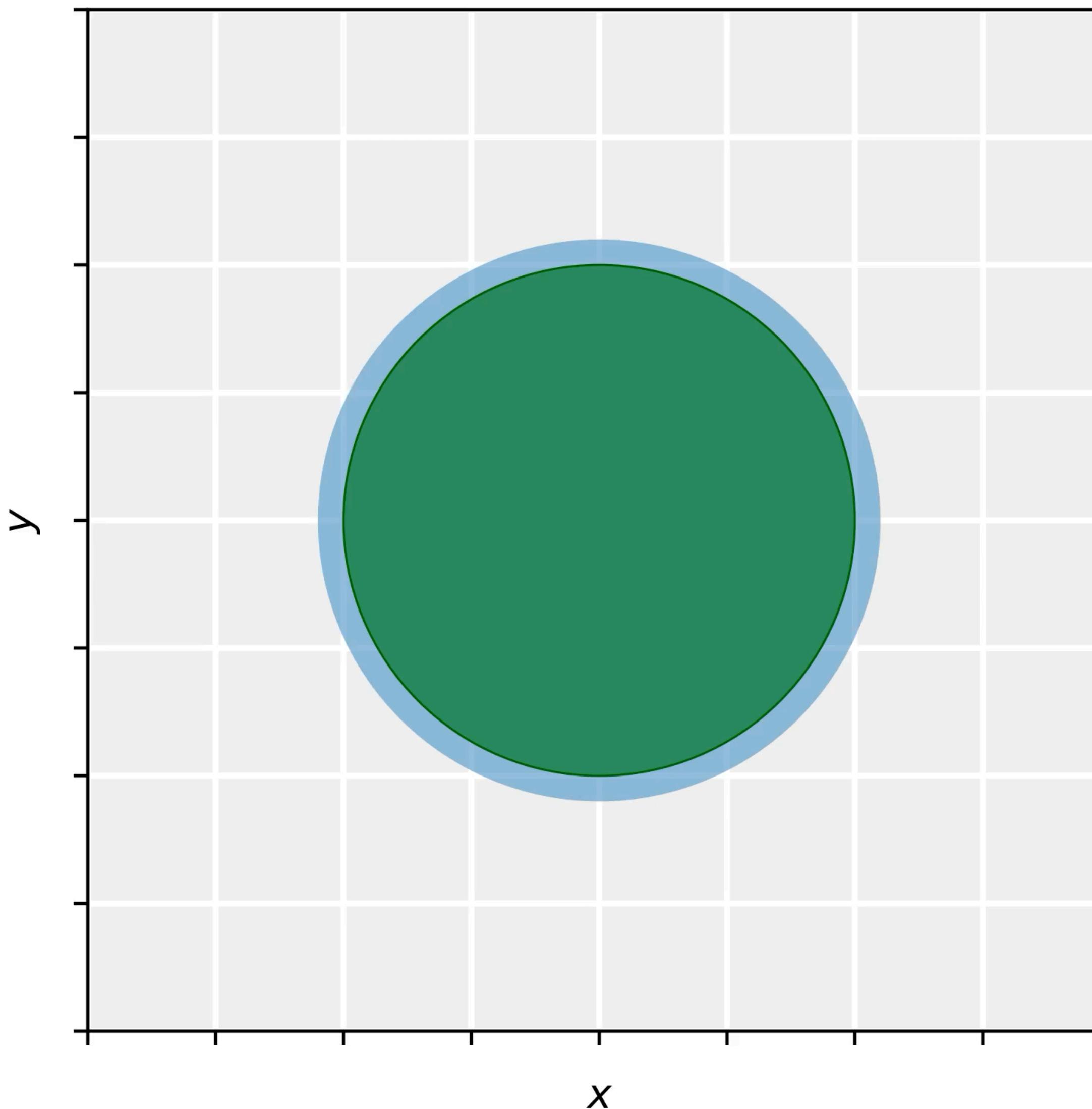


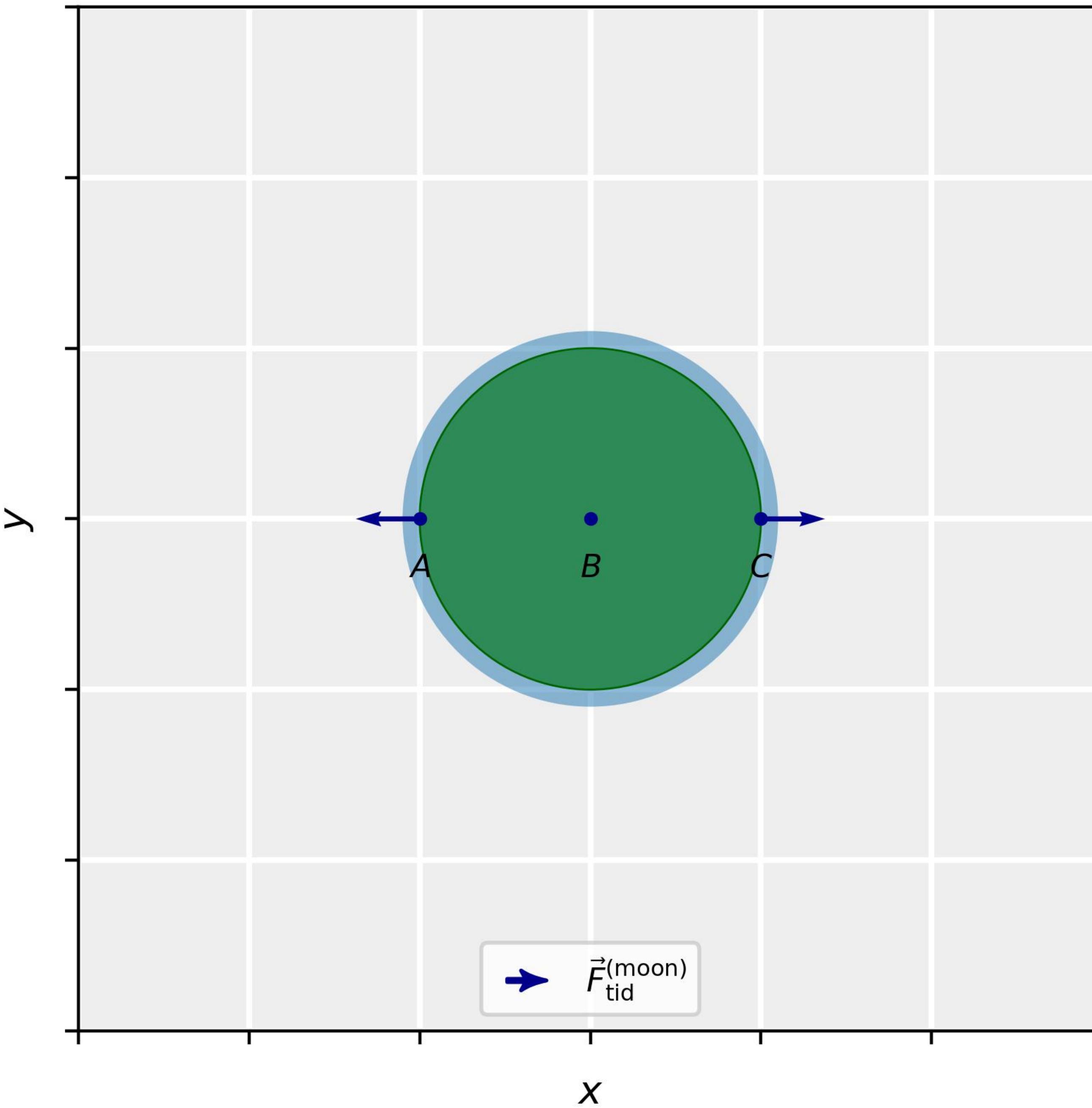


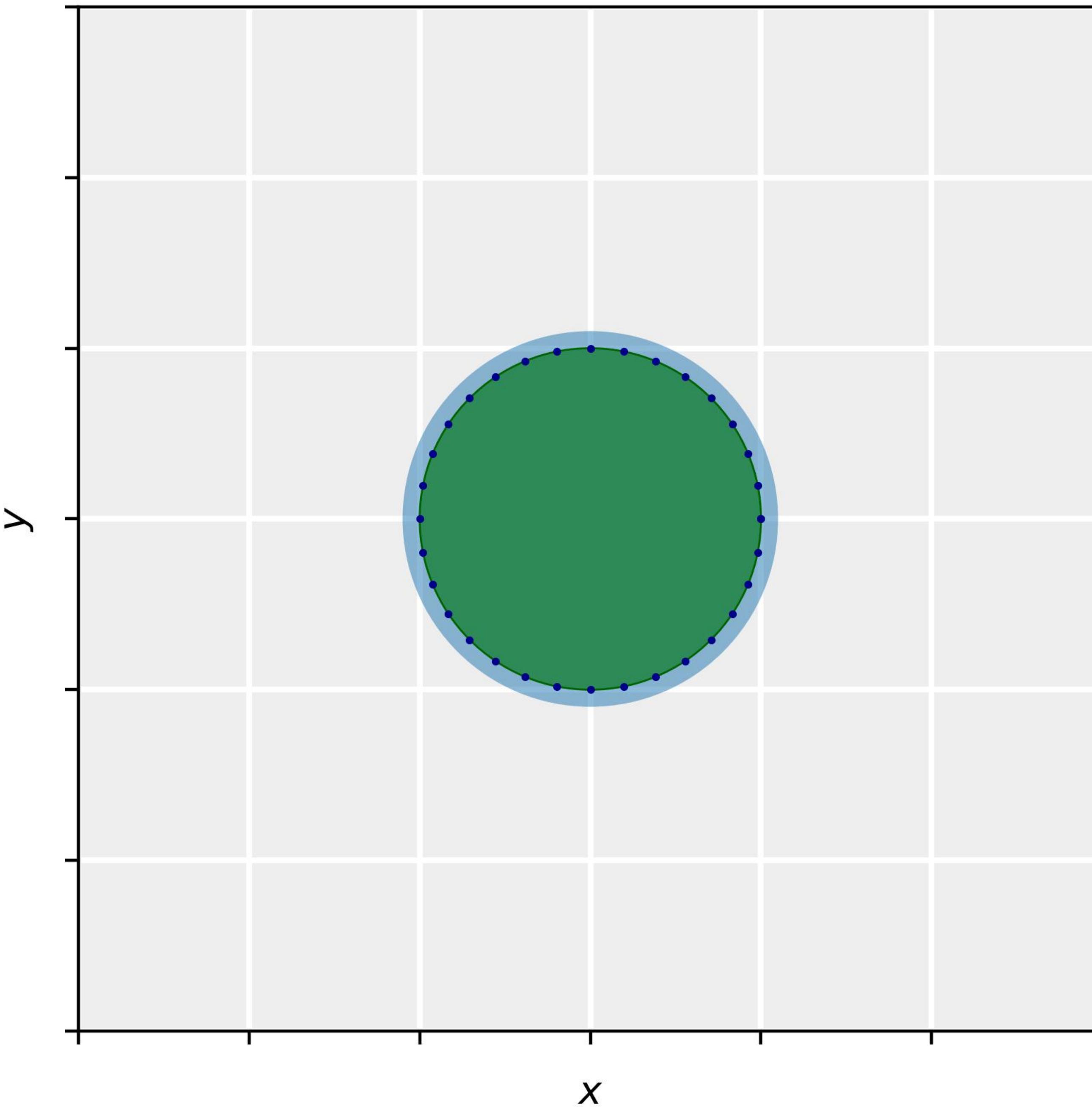
Frame: Earth-Moon Center of Mass

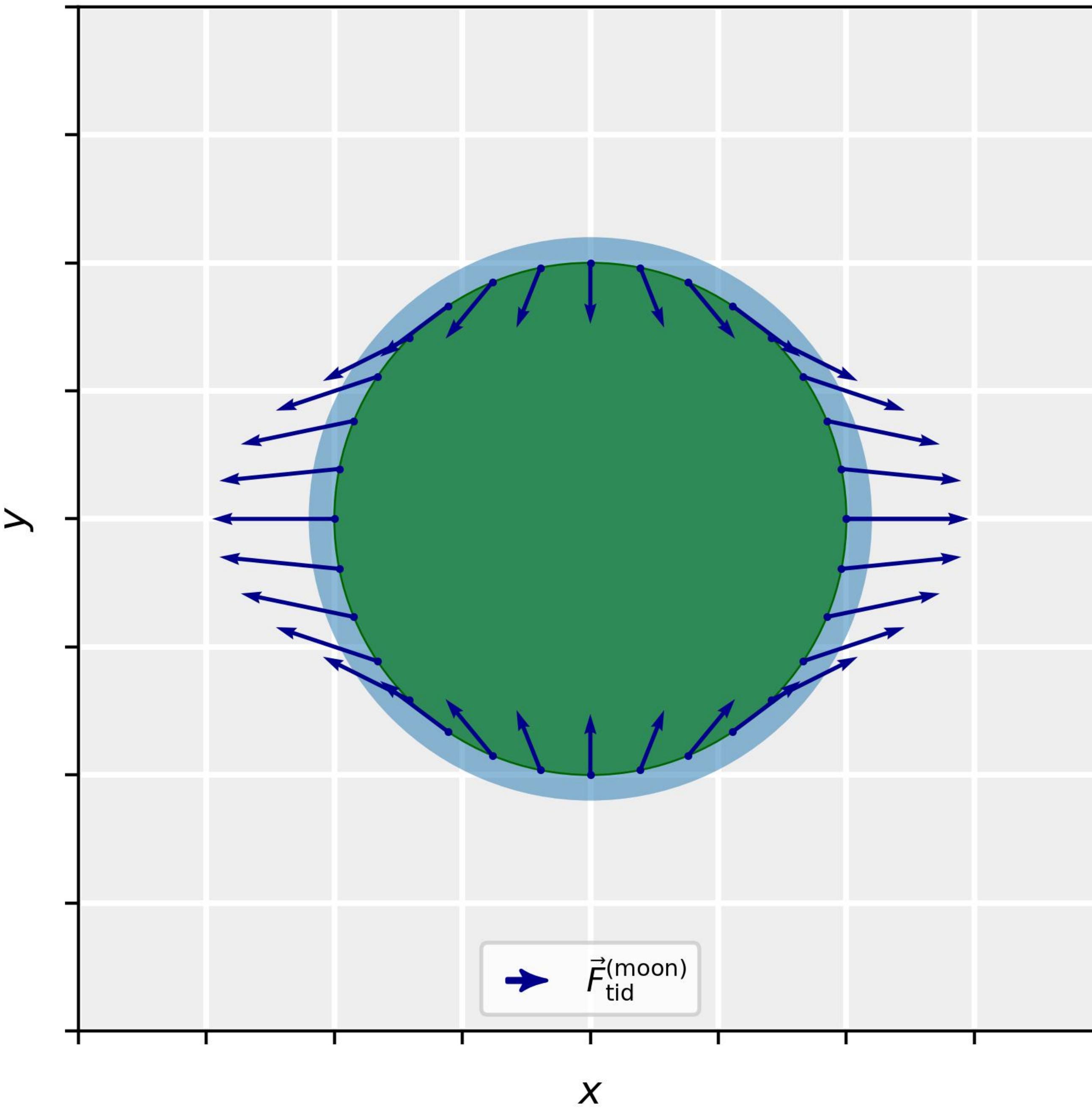


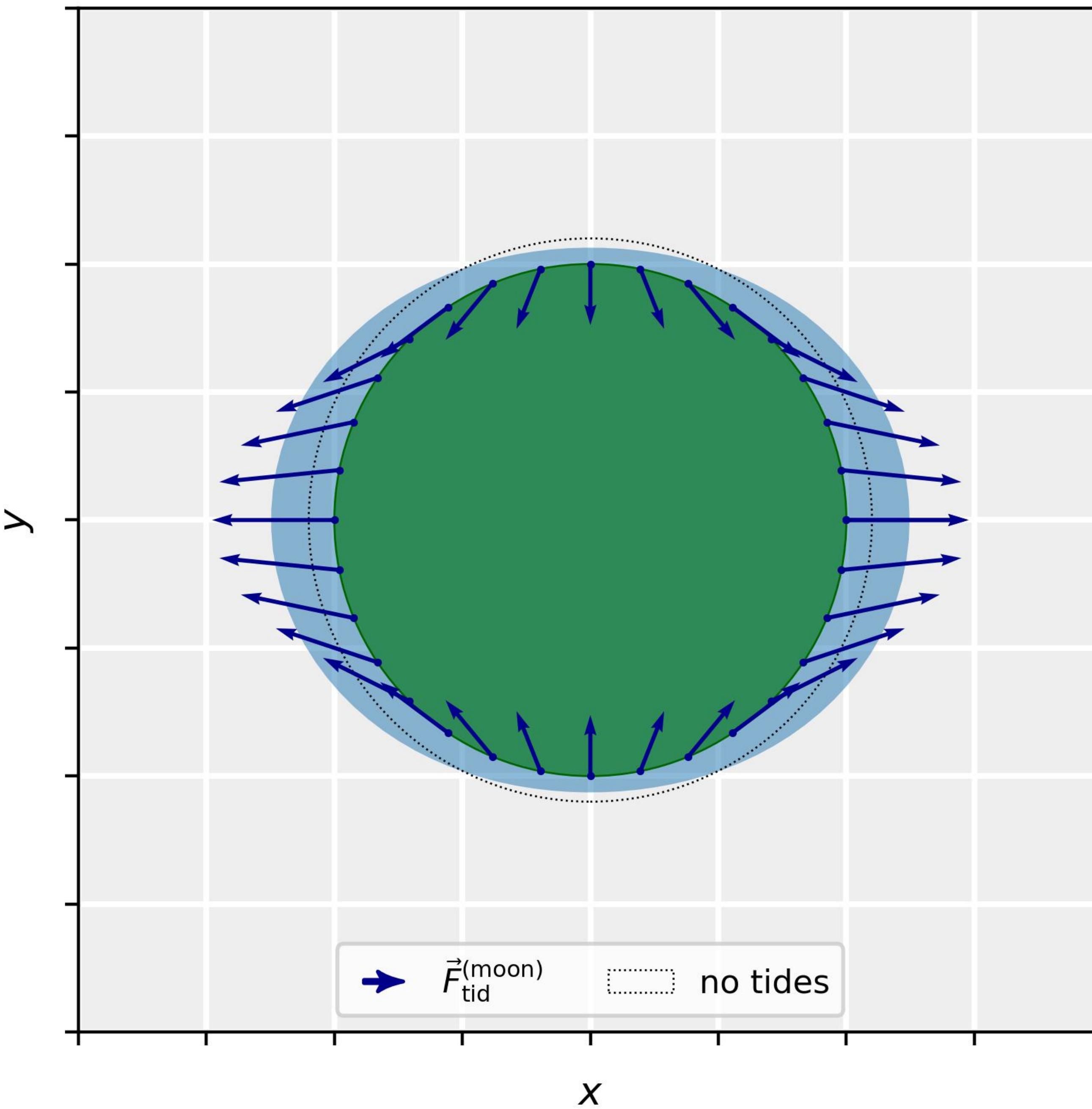
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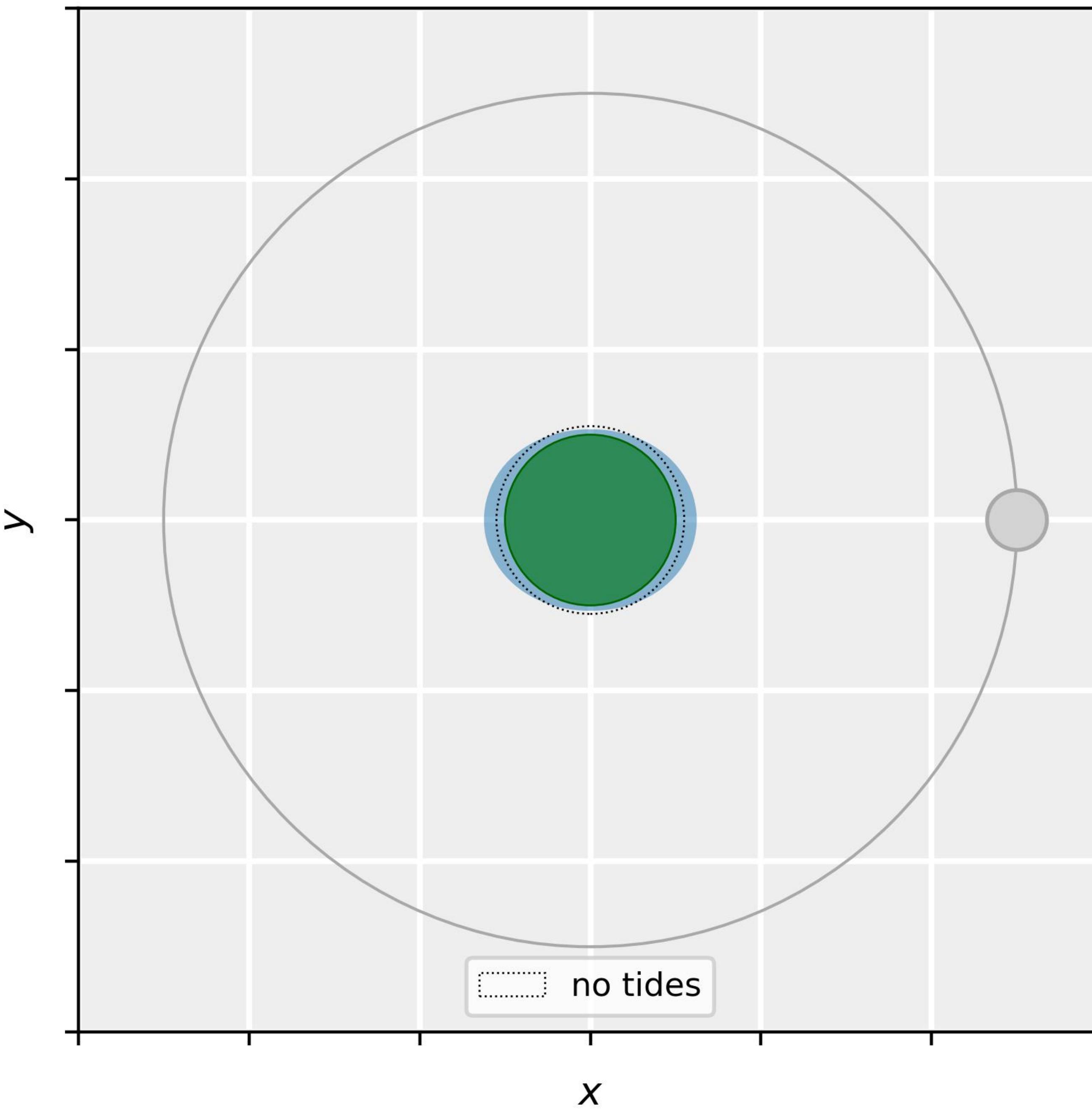


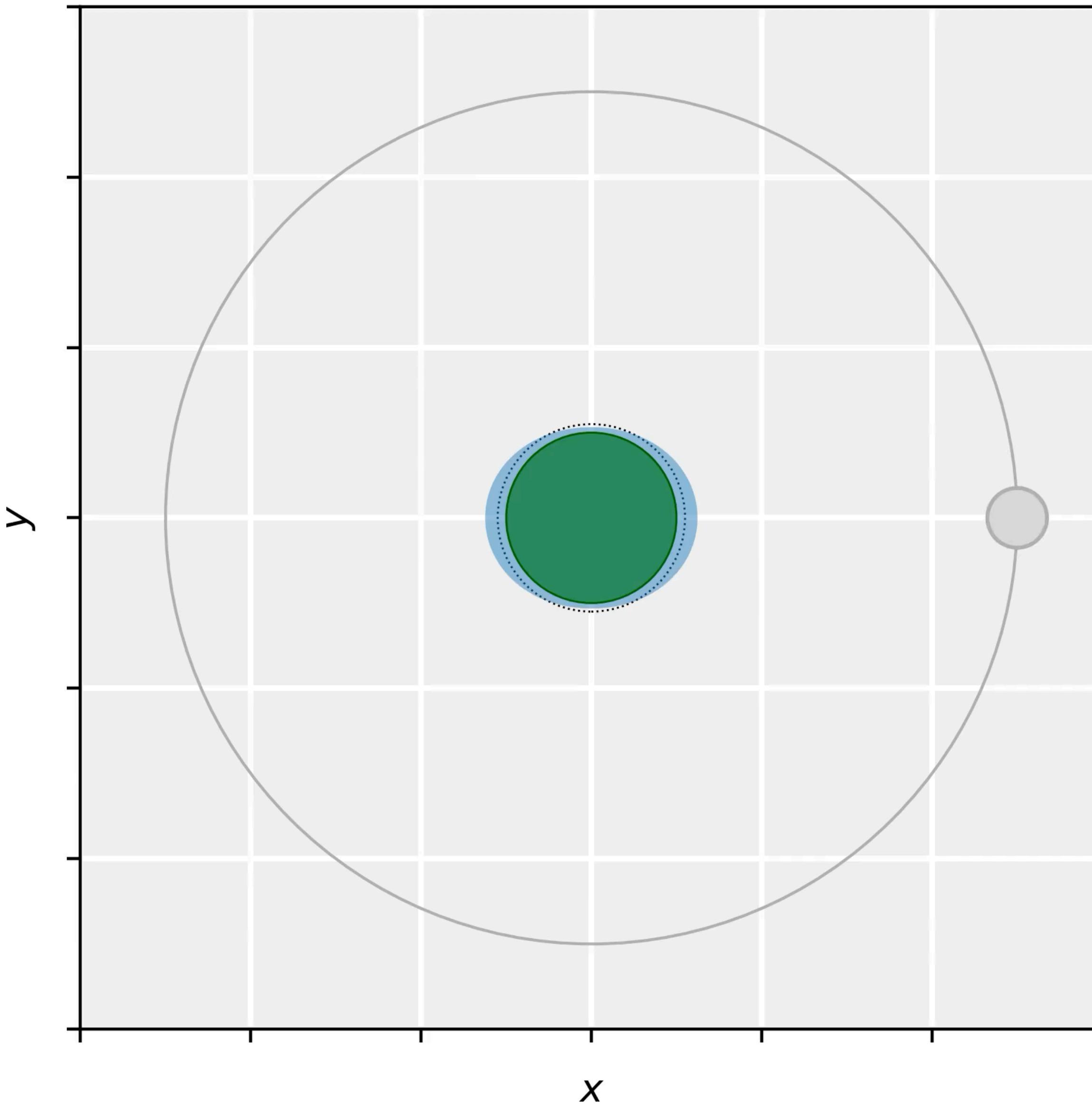


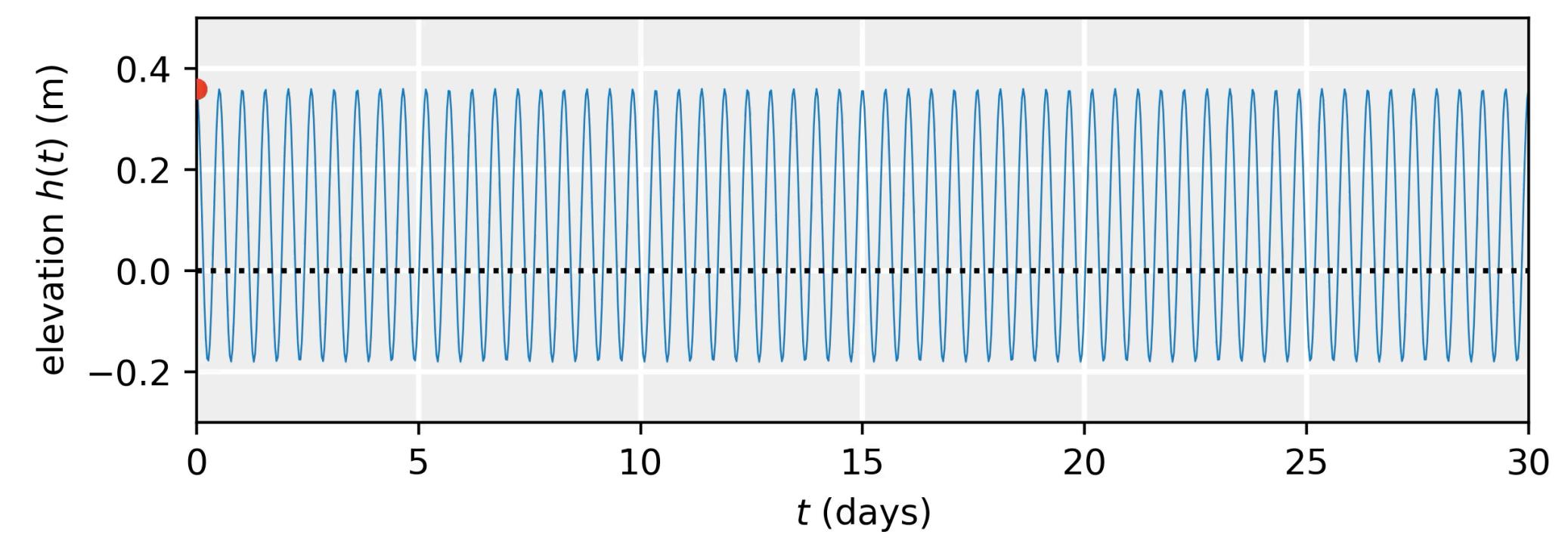
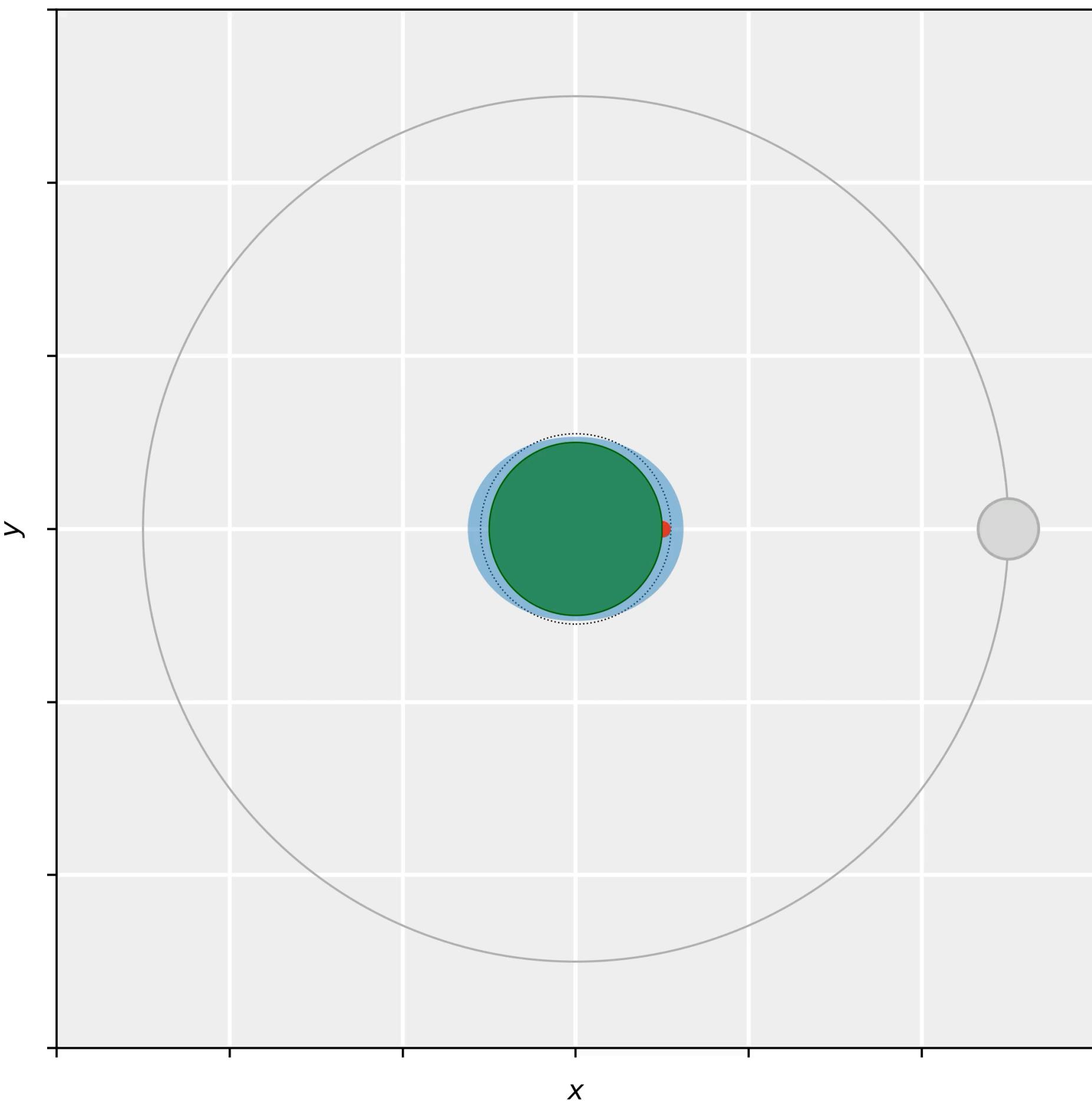




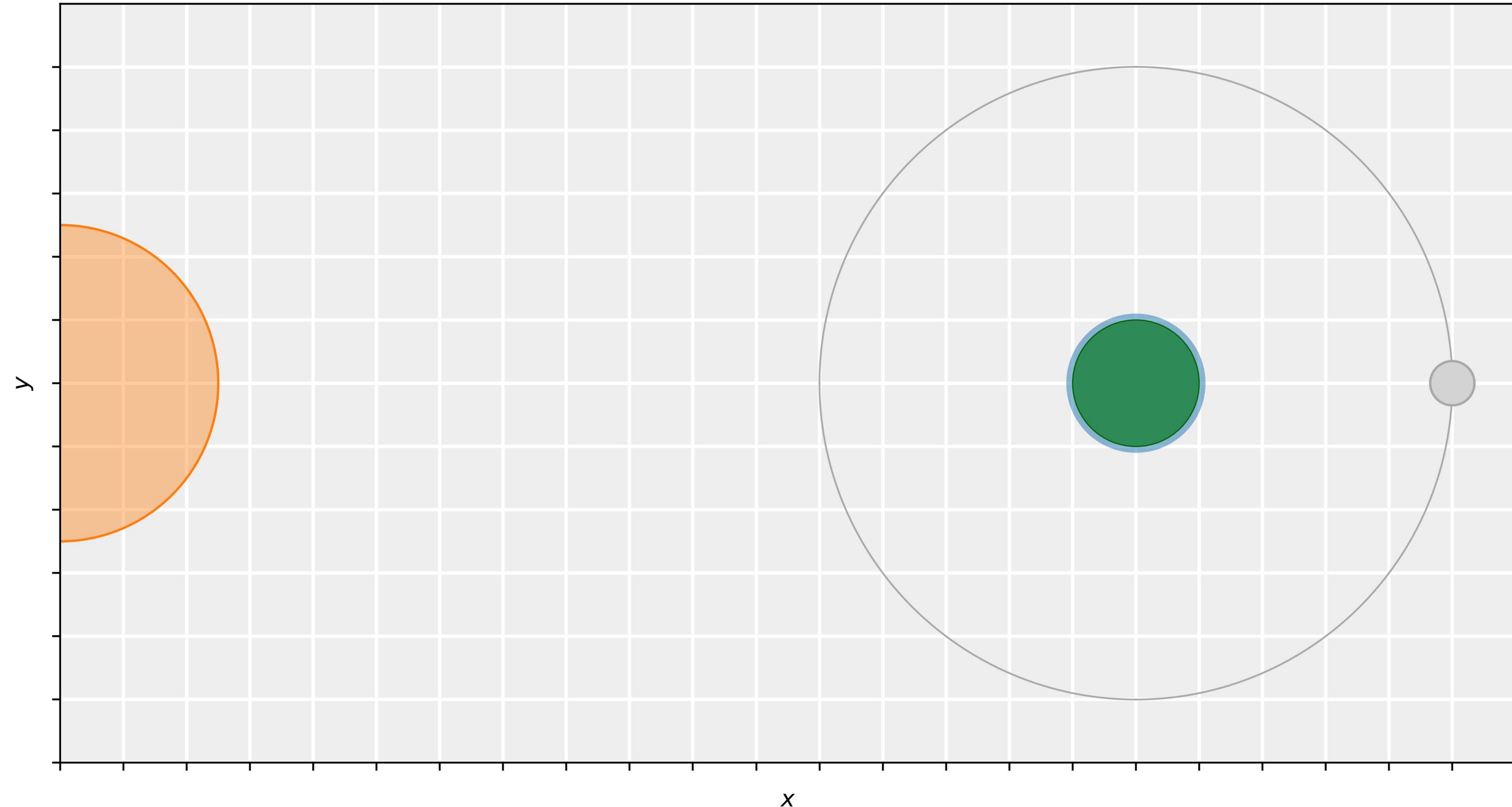


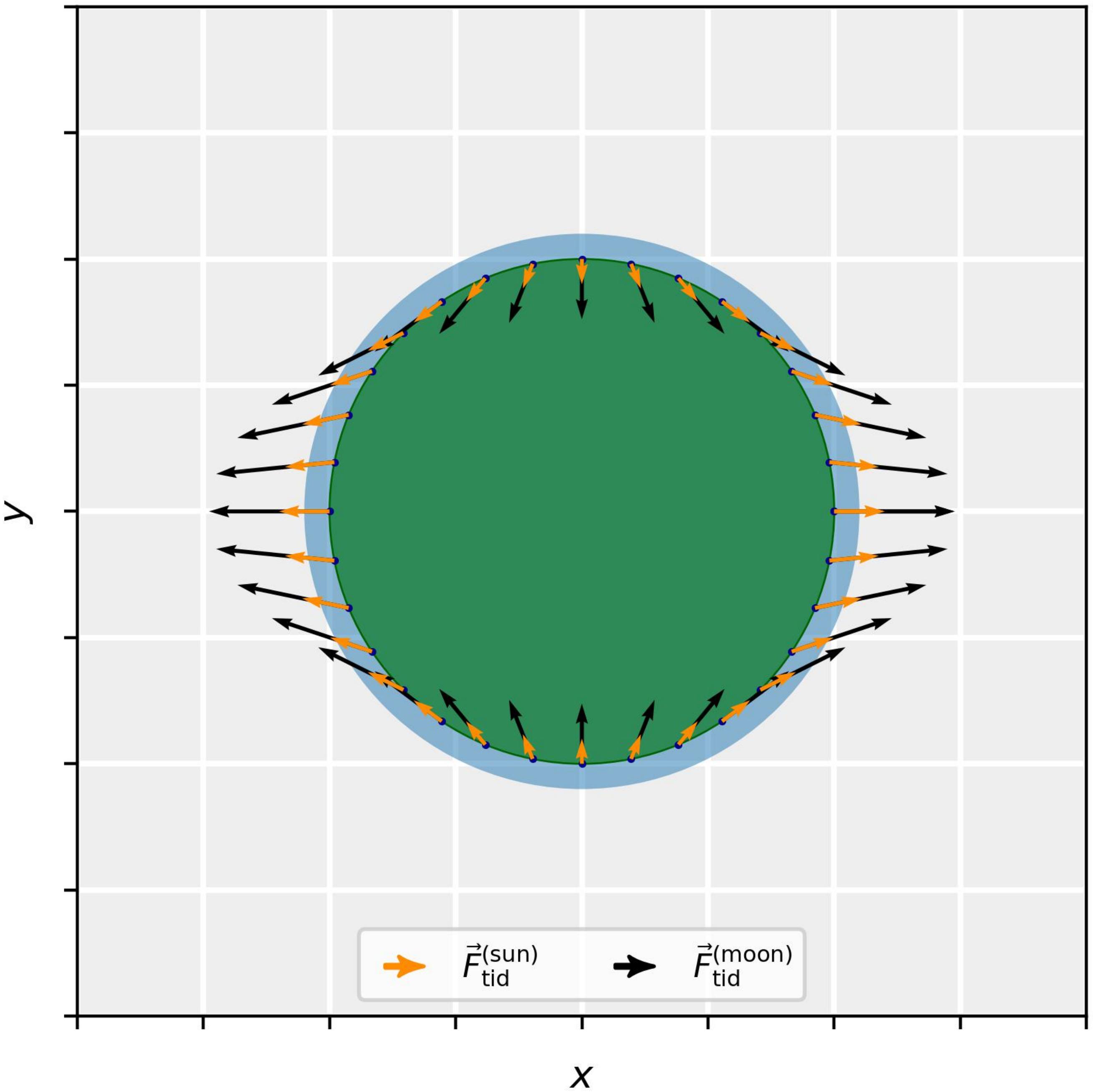


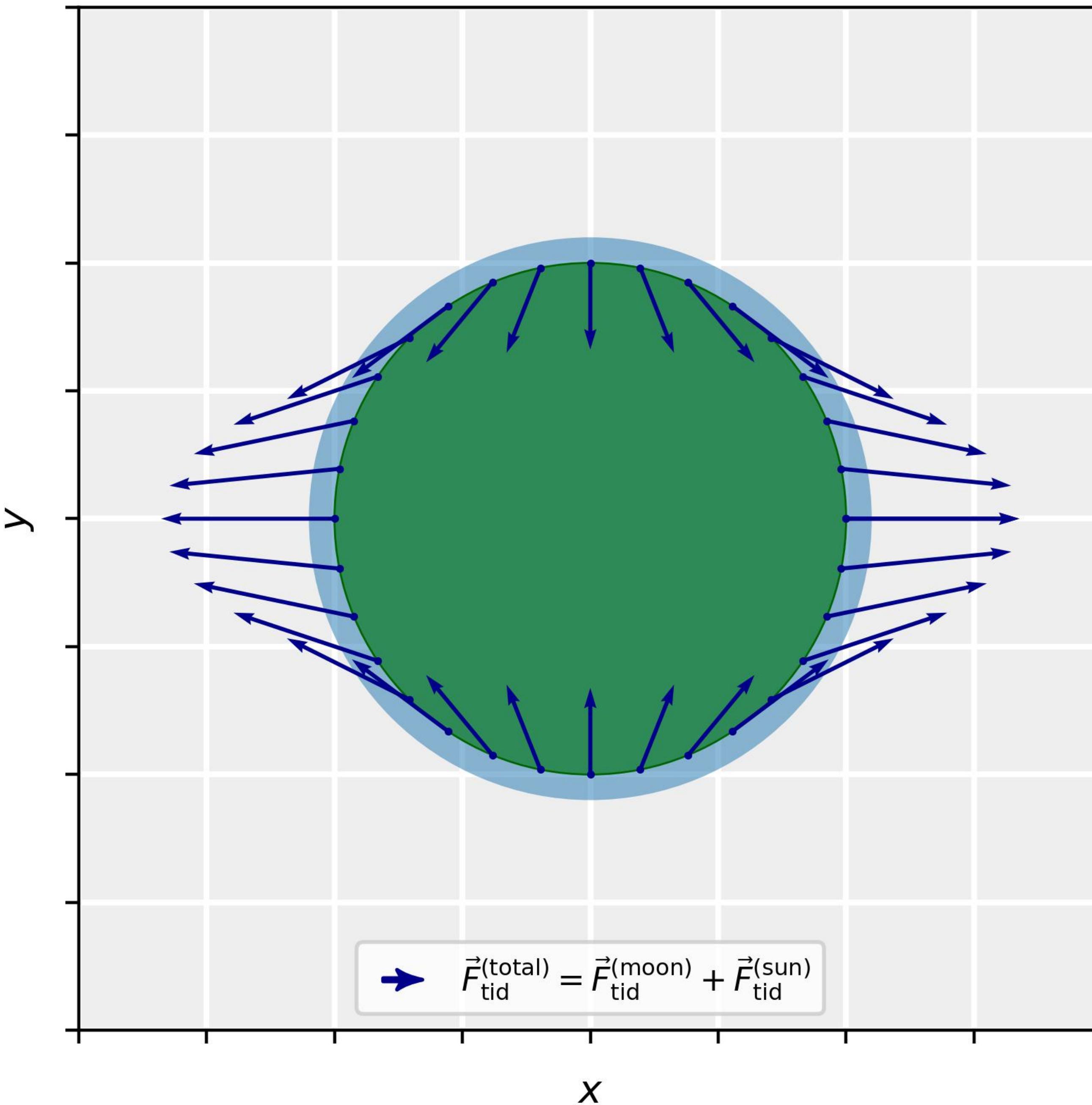


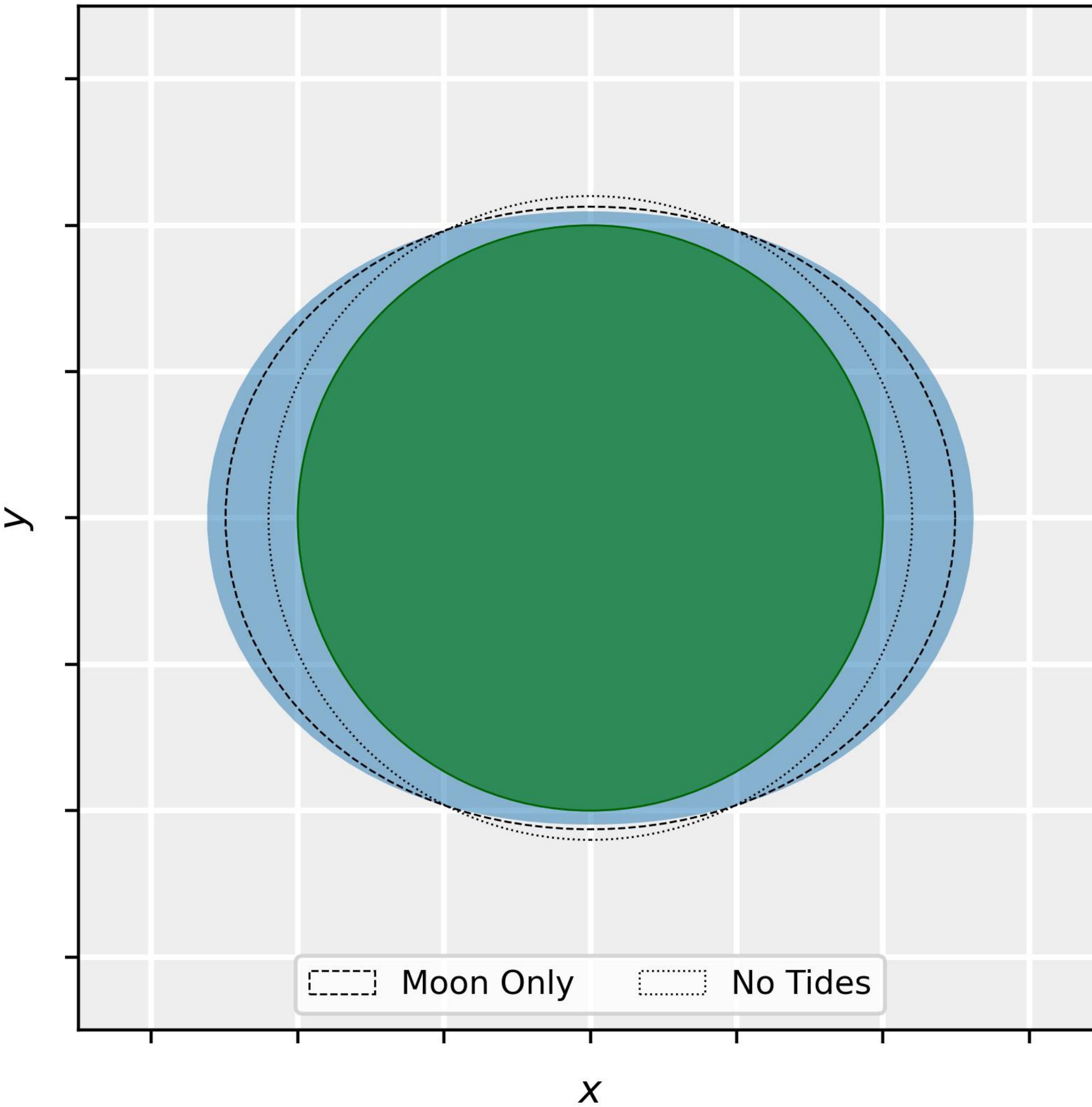


Frame: Co-rotating with Earth around Sun

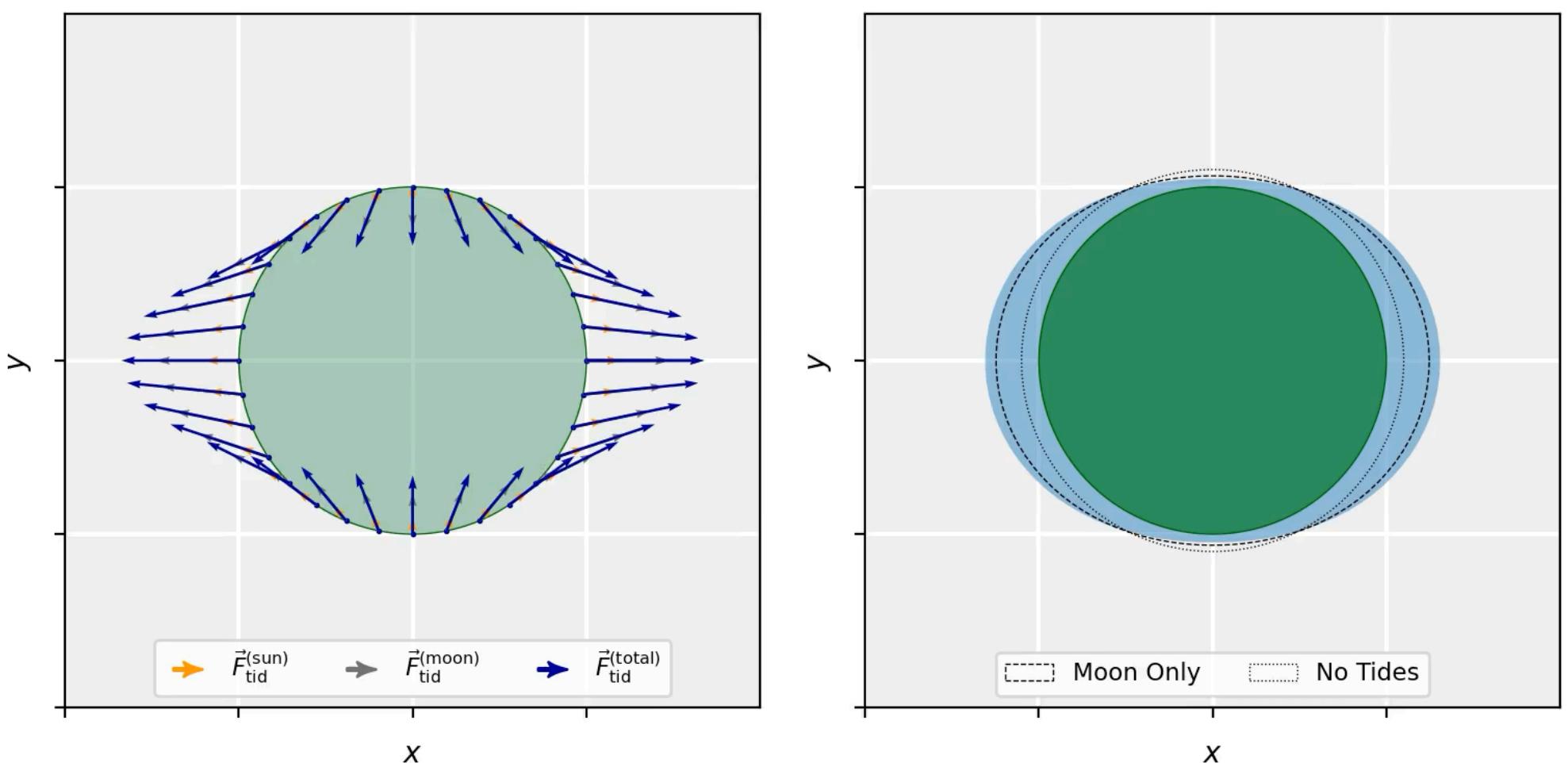
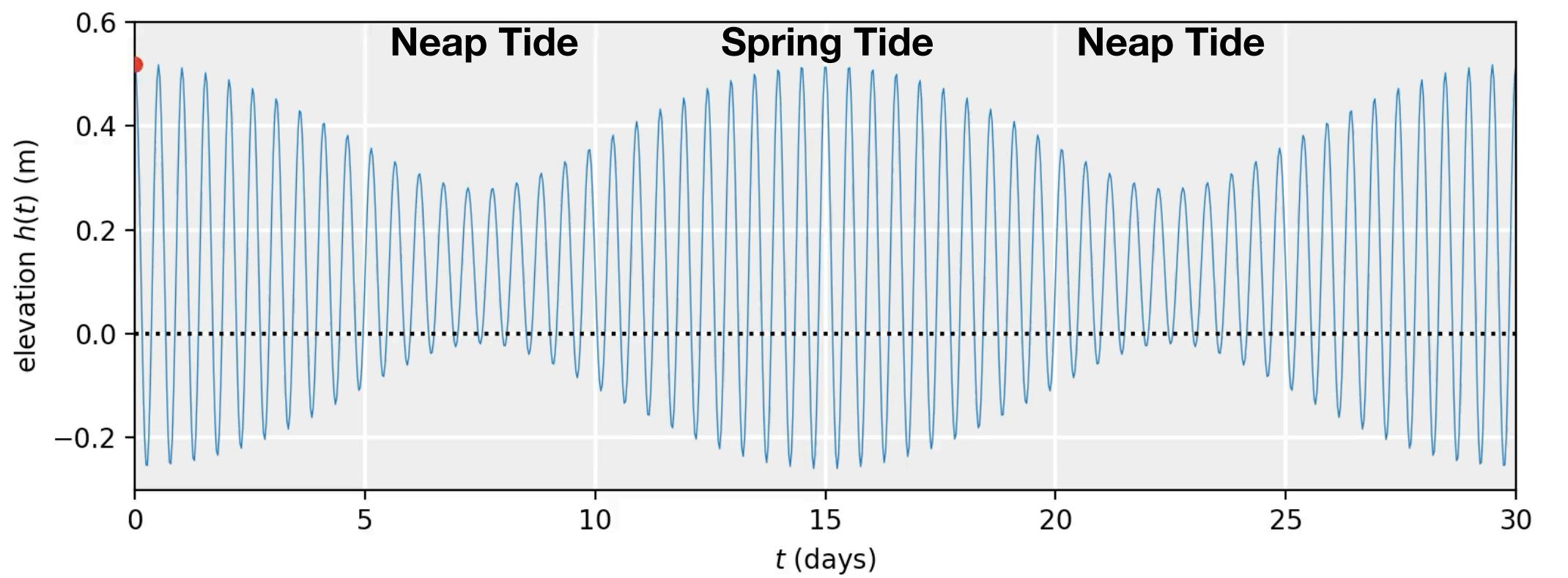
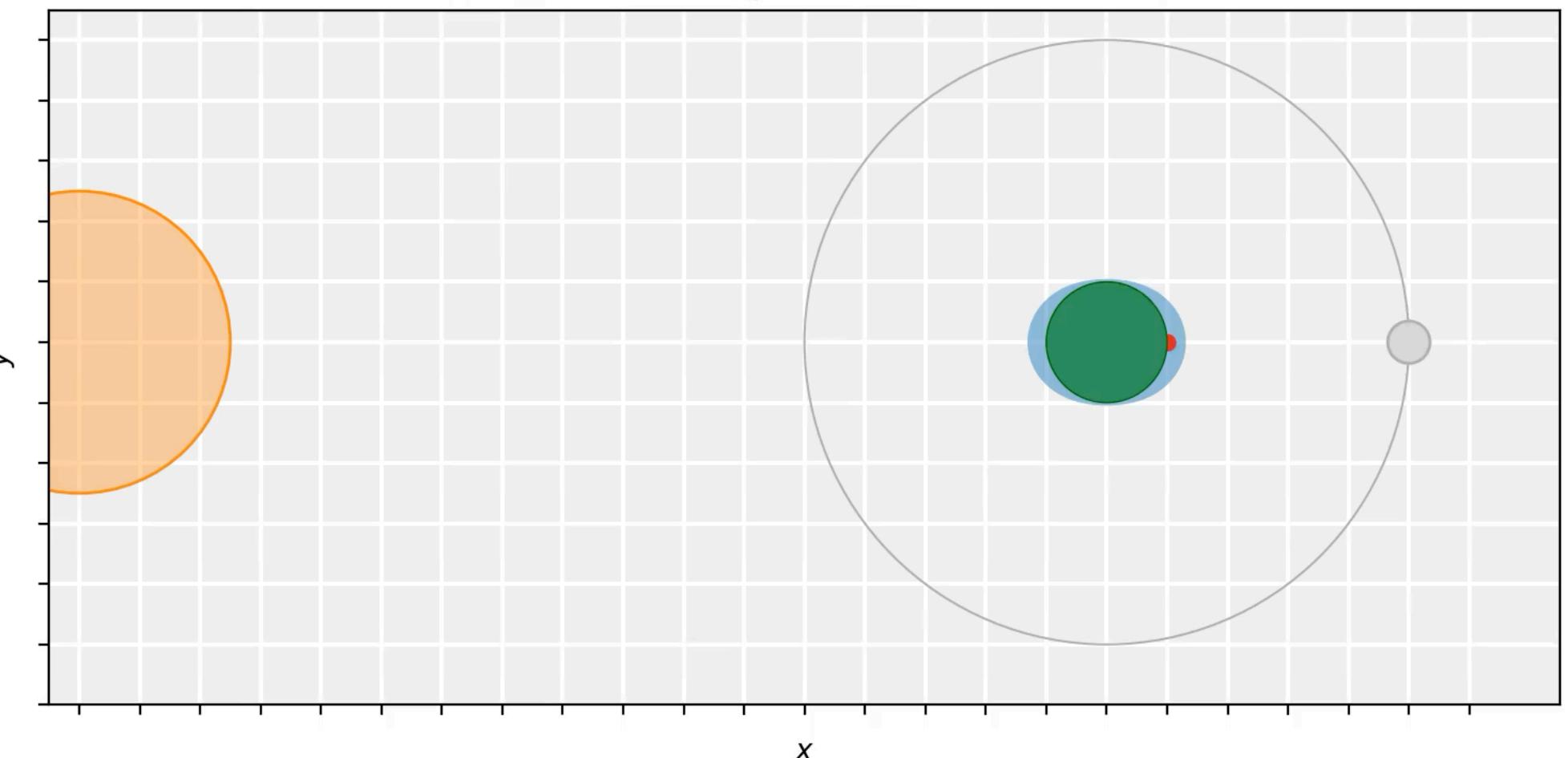




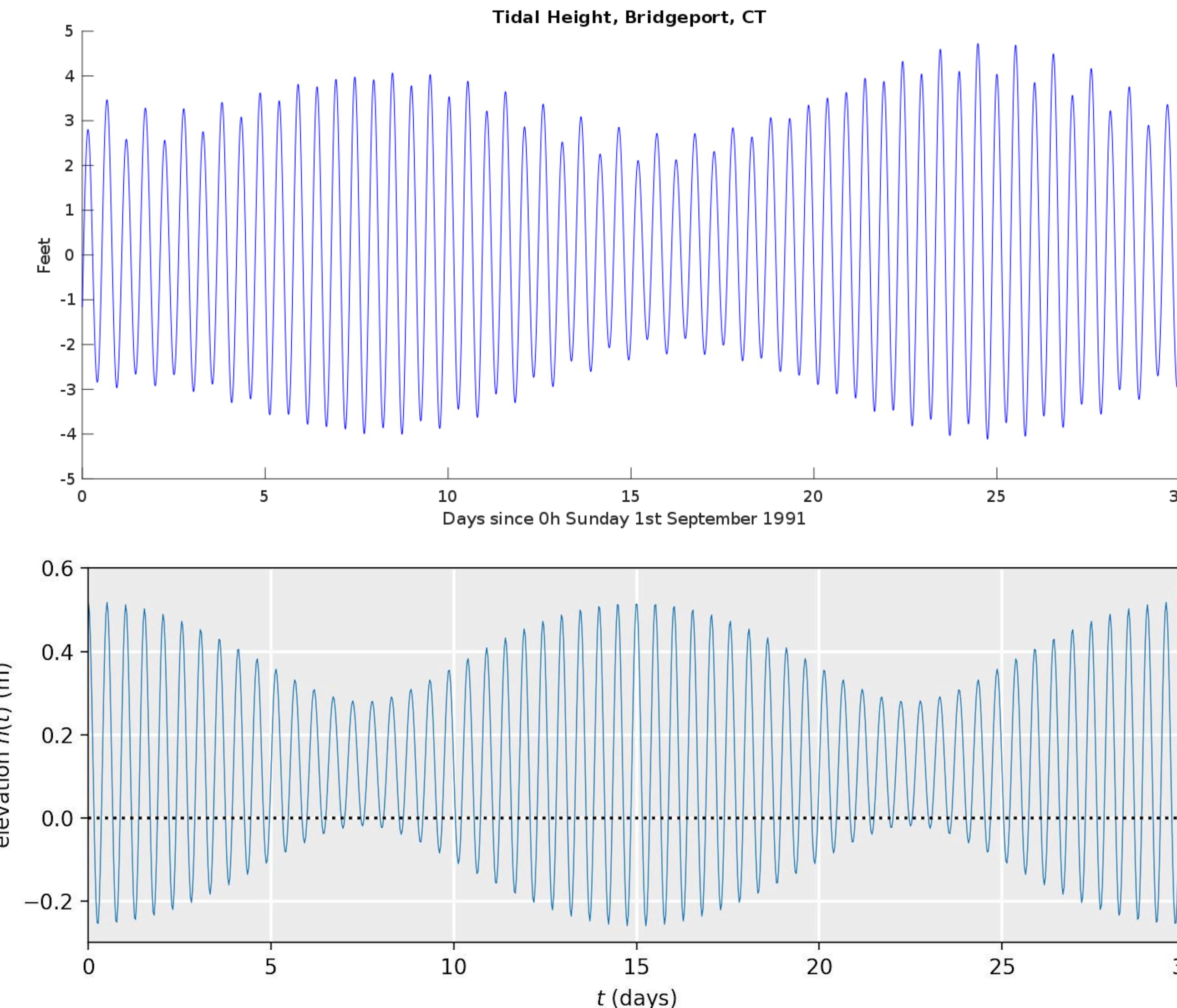




Frame: Co-rotating with Earth around Sun



What about Real Tides?



Implementation & Student Experience

- **Animations** are used in lectures (can be extended to lecture clips or tutorials):
 - Active setting using *Predict Explain Observe Explain* (PEOE) principle
- **Student Experience:**
 - “Animations help me develop more physical intuition.”
 - “Animations help me picture the time evolution of system and the meaning of initial conditions.”
 - “Animations force me to think about what the solutions should be, instead of blindly calculating stuff right away.”
 - “Animations show me visually which assumptions and approximations go into the solutions of a problem.”

* e.g.: S Van den Eynde, M Goedhart, J Deprez, M De Cock, International Journal of Science and Mathematics Education 21 (1), 25-47

The Digital Demos Database

- The animations that are developed so far can be found in on the physics demos website (*Digital Demos tab*):
 - <https://physicsdemos.web.rug.nl/digital-demos/>
- Mathematical details of the tides animations:
 - <https://physicsdemos.web.rug.nl/digital-demos/classical-mechanics-dd/tidal-forces/>

Questions?