

Nel libro *Flussi e riflussi. Indagine sull'origine di una teoria scientifica*, il matematico e storico della scienza [Lucio Russo](#) ricostruisce la storia della teoria luni-solare delle maree. Tra le altre cose, Russo spiega come questa teoria fu formulata in epoca ellenistica da **Seleuco di Seleucia** e poi dimenticata, per lo meno nella sua formulazione completa: sopravvisse infatti in due catene di trasmissione separate, ciascuna delle quali conservò solo una parte della teoria. Fu **Isaac Newton** a riunire i due filoni, ricomponendo (a sua insaputa) la teoria di Seleuco.

DIALOGO
 DI
GALILEO GALILEI LINCEO
 MATEMATICO SOPRAORDINARIO
 DELLO STUDIO DI PISA.
E Filosofo, e Matematico primario del
 SERENISSIMO
GR.DVCA DI TOSCANA.

Due ne i congressi di quattro giornate si discorre
 sopra i due

MASSIMI SISTEMI DEL MONDO
 TOLEMAICO, E COPERNICANO;

*Proponendo indeterminatamente le ragioni Filosofiche, e Naturali
 tanto per l'una, quanto per l'altra parte.*

CON PRI



VILEGI.

IN FIRENZA, Per Gio:Batista Landini MDCXXXII.

CON LICENZA DE' SUPERIORI.



THE FOURTH DAY

SAGREDO. I do not know whether you are really arriving later than usual for our accustomed discussion or whether it just seems so to me because of my desire to hear Salviati's thoughts on such an interesting matter. I have been watching through the window for a long time, hoping from one moment to the next to see the gondola come into view which I sent to fetch you.

SALV. I believe it is only your imagination that has made the time drag, rather than any tardiness on our part. But in order not to stretch it still further it will be good for us to get to the matter in hand without wasting any more words.

Let us see, then, how nature has allowed (whether the facts are actually such, or whether at a whim and as if to play upon our fancies) — has allowed, I say, the movements that have long been attributed to the earth for every reason except as an explanation of the ocean tides to be found now to serve that purpose too, with equal precision; and how, reciprocally, this ebb and flow itself cooperates in confirming the earth's mobility.† Up to this point the indications of that mobility have been taken from celestial phenomena, seeing that nothing which takes place on the earth has been powerful enough to establish the one position any more than the other. This we have already examined at length by showing that all terrestrial events from which it is ordinarily held that the earth stands still and the sun and the fixed stars are moving would necessarily appear just the same to us if the earth moved and the others stood still. Among all sublunary things it is only in the element of water (as something

Nature's whim to make the flow and ebb of the seas endorse the earth's mobility.

The tides and the earth's mobility reciprocally confirm one another.

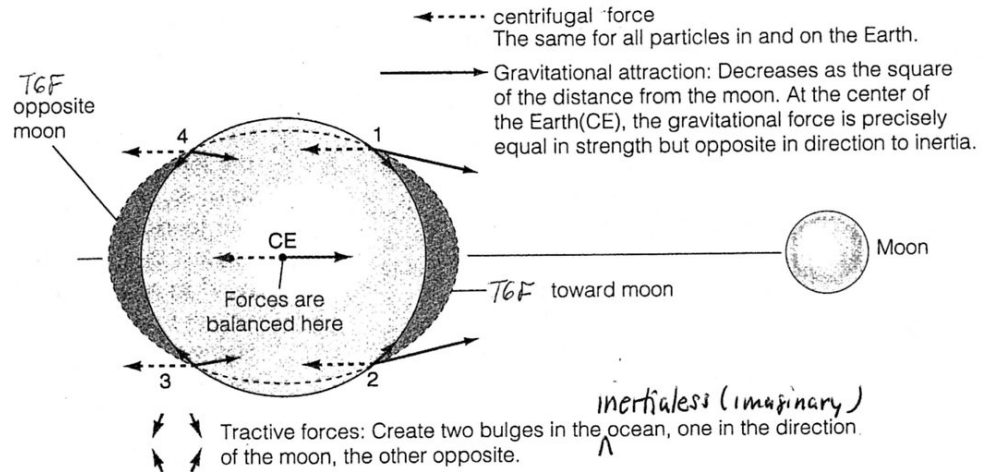
All terrestrial events except the ocean tides are impartial as to the earth's motion or rest.

First general conclusion: No ebb and flow if the terrestrial globe were immovable.

which is very vast and is not joined and linked with the terrestrial globe as are all its solid parts, but is rather, because of its fluidity, free and separate and a law unto itself) that we may recognize some trace or indication of the earth's behavior in regard to motion and rest. After having many times examined for myself the effects and events, partly seen and partly heard from other people, which are observed in the movements of the water; after, moreover, having read and listened to the great follies which many people have put forth as causes for these events, I have arrived at two conclusions which were not lightly to be drawn and granted. Certain necessary assumptions having been made, these are that if the terrestrial globe were immovable, the ebb and flow of the oceans could not occur naturally; and that when we confer upon the globe the movements just assigned to it, the seas are necessarily subjected to an ebb and flow agreeing in all respects with what is to be observed in them.

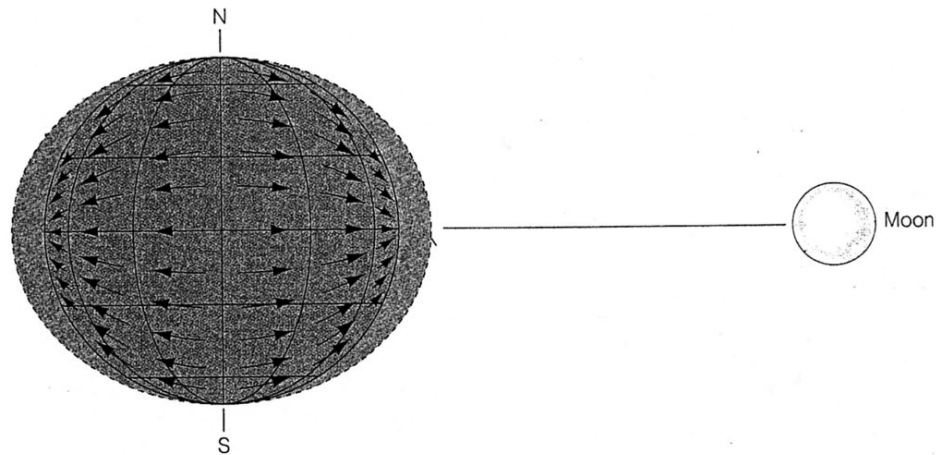
Per riassumere la teoria galileiana delle maree, possiamo servirci delle [parole stesse](#) del suo autore, che ci paiono particolarmente chiare e pertinenti:” *...Figuriamoci dunque una barca veneziana con mediocre velocità per la Laguna, portando placidamente l’acqua della quale ella sia piena, ma che poi, o per dare in secca o per altro impedimento che le sia opposto, venga notabilmente ritardata; non perciò l’acqua contenuta perderà, al pari della barca, l’impeto già concepito, ma, conservandolo, scorrerà avanti verso la prua, ove notabilmente si alzerà, abbassandosi verso la poppa; ma se, per l’opposto, all’istessa barca, nel mezzo del suo placido corso, verrà con notevole aumento aggiunta nuova velocità, l’acqua contenuta, prima di abituarsene, restando nella sua lentezza, rimarrà indietro, cioè verso la poppa, ove in conseguenza si solleverà, abbassandosi nella prua.*”

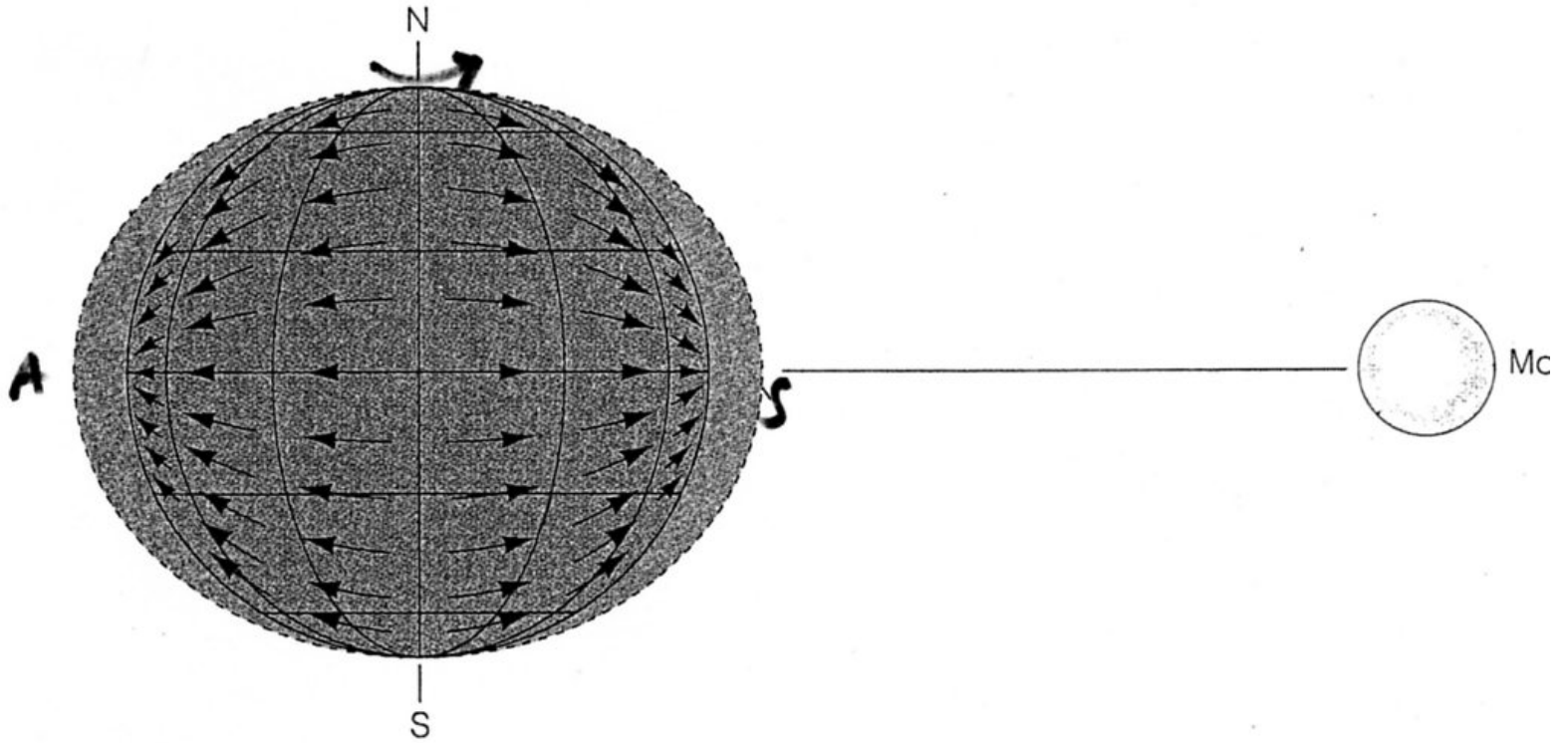
Procedendo in modo analogico, cioè assimilando concettualmente la Terra alla gondola, e i mari all’acqua contenuta nella gondola stessa, Galileo ritiene di poter spiegare il moto diurno di marea.

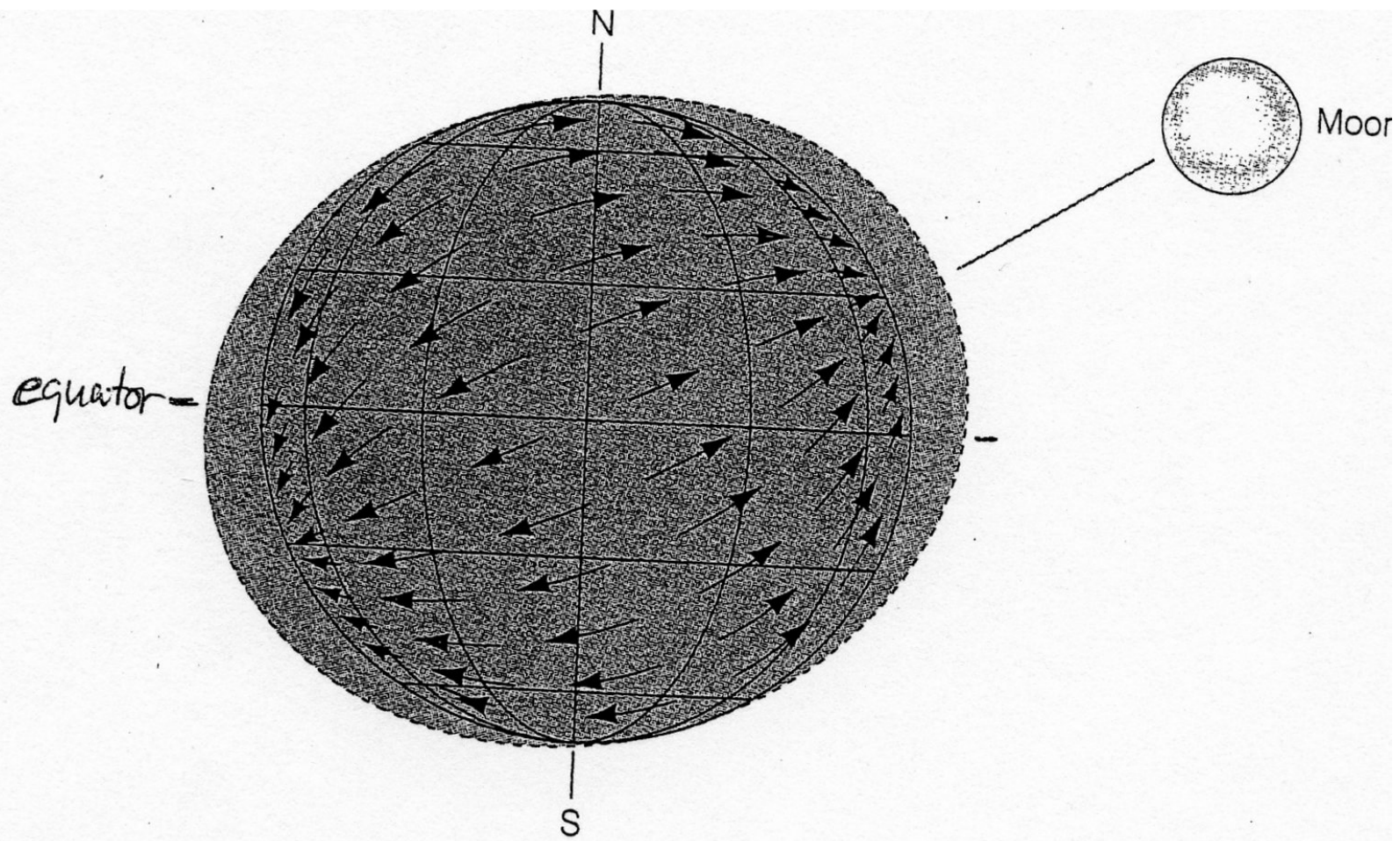


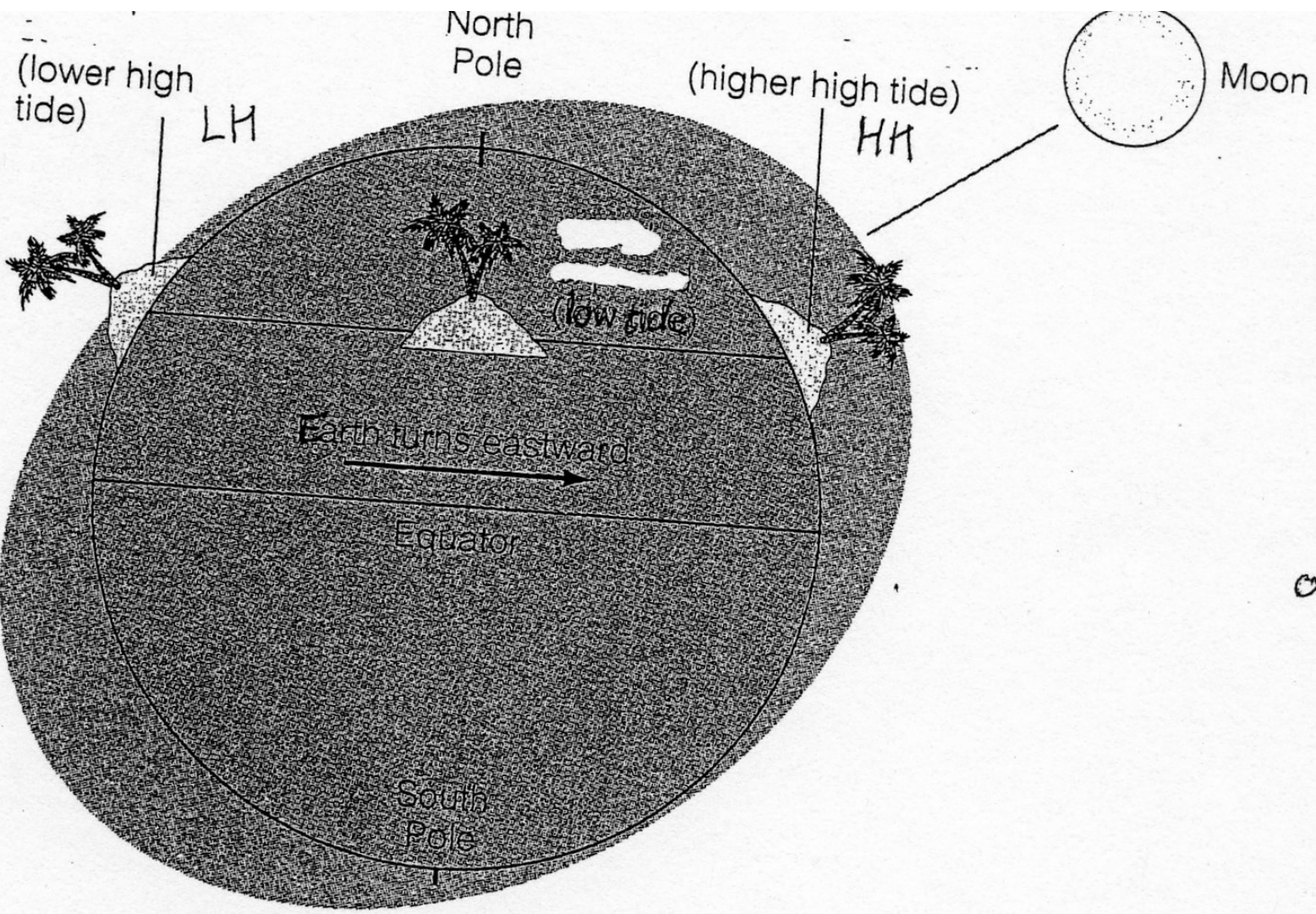
The two forces that can move the ocean are balanced only at the center of Earth (point CE). Elsewhere the net imbalance is a small force that causes ocean water to converge into two equal "bulges," as shown.

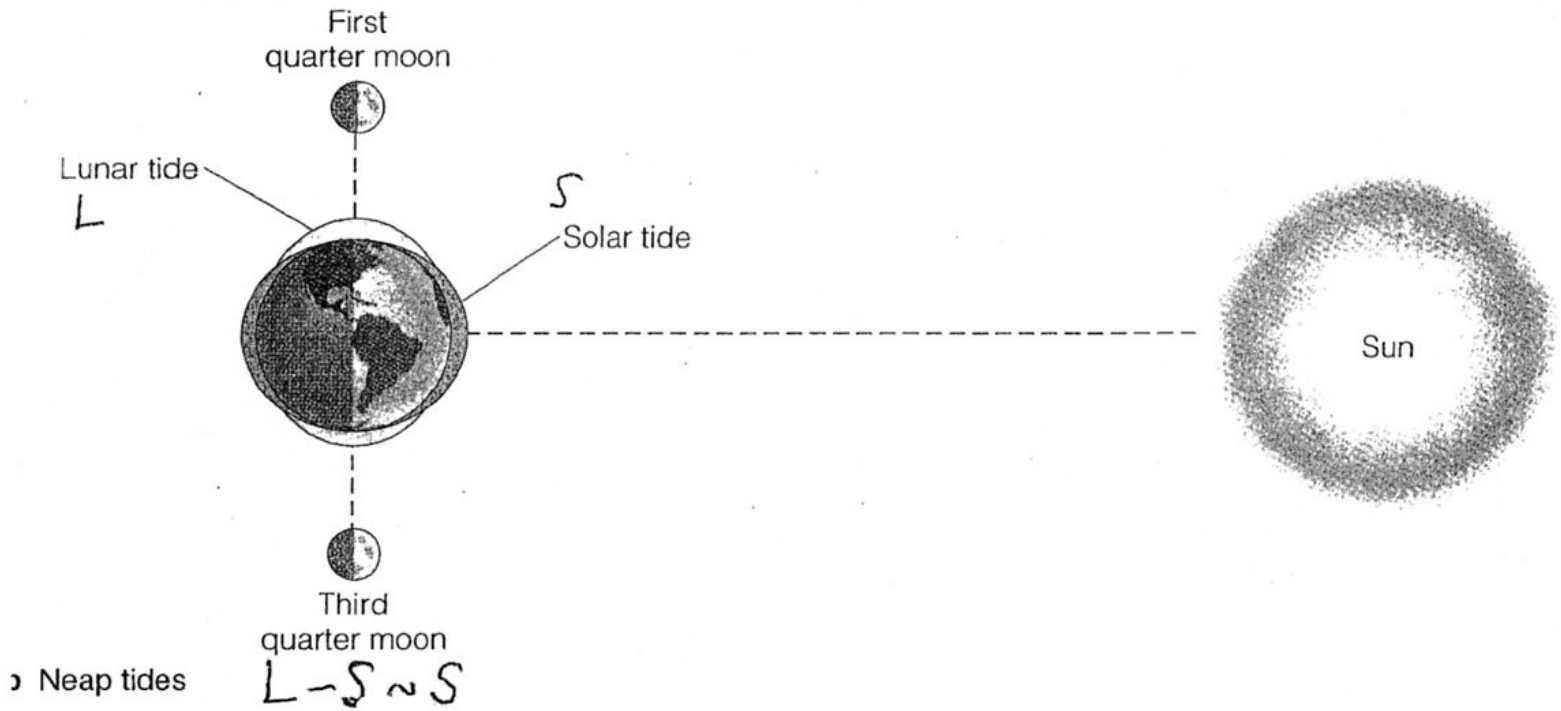
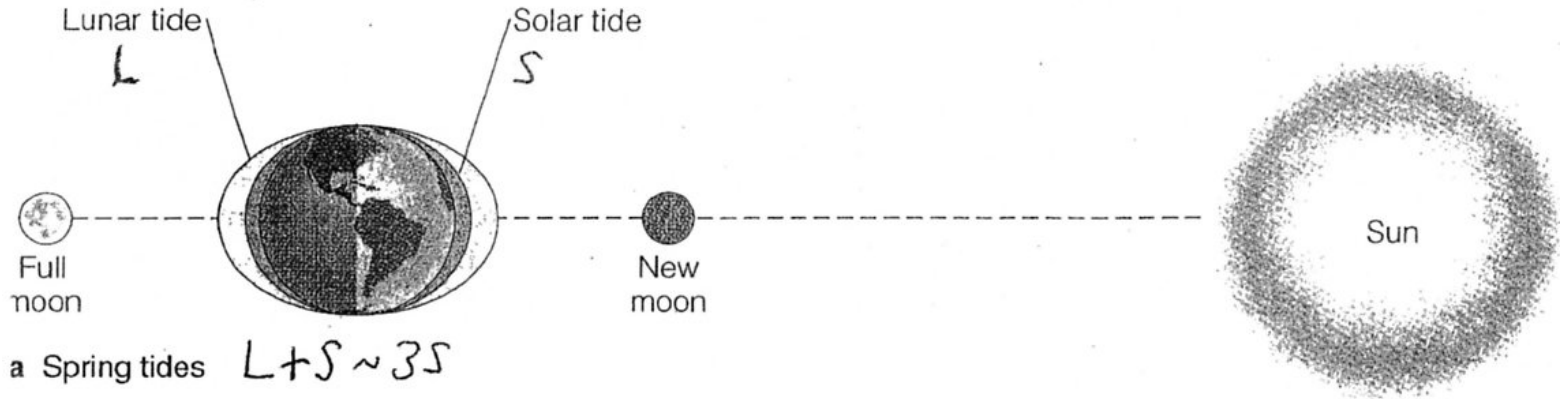
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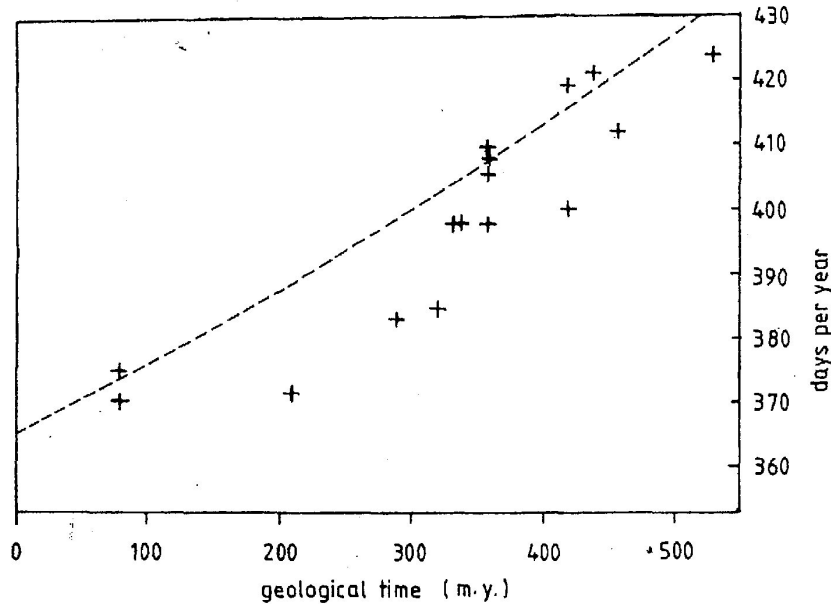


Fig. 1. Summary of paleontological data showing days per year. (After Scrutton 1978). The broken line extrapolates the present rate of deceleration

Figure 1 is taken from a review of Scrutton (1978) presented at the first Bielefeld meeting on tidal friction. It summarizes all paleontological data available and indicates that the length of the day (l.o.d.) has changed remarkably during the last 500 m.y. But the assumption of a constant lengthening of the day of 2 ms/century (about the present rate) can only roughly fit the data as shown by the dashed line. Instead, there is an indication of a relatively low dissipation rate during the last 300 m.y. (up to the Permian), whereas before that time a rate even somewhat higher seems reasonable.