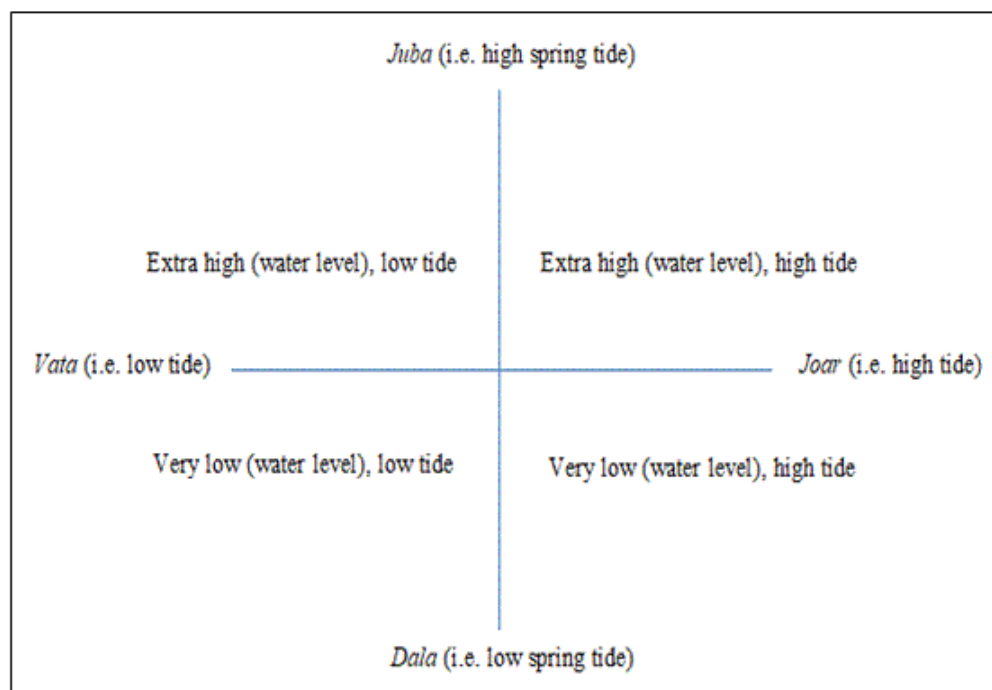


## APPENDIX 1

In scientific literature, *Juba* and *Dala* are explained as spring tides (when the earth, the moon, and sun are in alignment). During a new moon, the gravitational forces of the moon and the sun pull along the same direction resulting in high water level (i.e. *Juba*). During a full moon, the gravitational forces of the sun and the moon exert forces in opposite direction resulting in low level of water (i.e. *Dala*) (Fig. S.1) (Gönnert and Sossidi, 2011; Park and Suh, 2012). When a high tide coincides with *Juba* it produces a very high level of tide (i.e. higher than average) and conversely, when low tide coincides with *Dala* it produces a very low level of tide (i.e. lower than average). During Cyclone Sidr, it was low tide with low spring tide (lower left Quatrain in Fig. S.1).



**Fig. S.1:** Connection between spring tides with high and low tides

### References

- Gönnert, G., Sossidi, K., 2011. A new approach to calculate extreme storm surges. *Irrig. Drain.* 60, 91–98. <https://doi.org/10.1002/ird.681>
- Park, Y.H., Suh, K.D., 2012. Variations of storm surge caused by shallow water depths and extreme tidal ranges. *Ocean Eng.* 55, 44–51. <https://doi.org/10.1016/j.oceaneng.2012.07.032>