UNDERSTANDING THE SOUTHWEST MONSOON AND ITS INFLUENCE ON ANCIENT TRADE BETWEEN INDIA, THE WEST AND SOUTH EAST ASIA

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A **monsoon** is a rainy season which lasts for several months and has lasting climatic effects. It refers to both the wet monsoon and the dry monsoon experienced periodically in the South East Asian continent. The term was first used in English with this meaning in India, Bangladesh, Pakistan and neighbouring countries to mean the seasonal winds blowing from the Indian Ocean and Arabian Sea in the southwest bringing heavy rainfall to the region.

The English name **Monsoon**, was derived from the Urdu/Hindi word *mausam* meaning 'weather' in the time of the British Empire.

In hydrology, monsoonal rainfall is considered to be that which occurs in any region that receives the majority of its rain during a particular season, and so monsoons are referred to in relation to other regions such as in North America, Sub-Saharan Africa, Brazil and East Asia.

In terms of total precipitation, total area covered and the total number of people affected, monsoons affecting the Indian Subcontinent dwarf the North American monsoon (also called the "Mexican", "southwest", "desert", or "Arizona" monsoon).

The definition includes major wind systems that change direction seasonally. Majority of summer monsoons have a dominant westerly component and a strong tendency to ascend and produce copious amounts of rain (because of the condensation of water vapour in the rising air). The intensity and duration, however, are not uniform from year to year. Winter monsoons, by contrast, have a dominant easterly component and a strong tendency to diverge, subside, and cause drought.

History

The Asian monsoon strengthened due to the uplift of the Tibetan Plateau after the collision of India and Asia around 50 million years ago. Evidence for when this first happened, remains controversial. Many geologists believe the monsoon first became strong around 8 million years ago based on records from the Arabian Sea and the record of wind-blown dust in the Loess Plateau of China. More recently plant fossils in China and new long-duration sediment records from the South China Sea suggests, though not confirmed, a much older monsoon starting around 24 million years ago and linked to early Tibetan uplift. The monsoon has varied significantly in strength since this time, largely linked to global climate change, especially the cycle of the Pleistocene ice ages.

Process of Monsoon

Monsoons are caused by the larger amplitude of the seasonal cycle of land temperature compared to that of nearby oceans. This differential warming happens because heat in the ocean is mixed vertically through a "mixed layer" that may be fifty metres deep, through

the action of wind and buoyancy-generated turbulence, whereas the land surface conducts heat slowly, with the seasonal signal penetrating perhaps a metre or so. Additionally, the specific heat of liquid water is significantly higher than that of most materials that make up land. Together, these factors mean that the heat capacity of the layer participating in the seasonal cycle is much larger over the oceans than over land, with the consequence that land warms faster and reaches a higher temperature than the ocean.

The hot air over the land tends to rise, creating an area of low pressure. This creates a steady wind blowing toward the land, bringing the moist near-surface air over the oceans with it. Similar rainfall is caused by the moist ocean air being lifted upwards by mountains, surface heating, convergence at the surface, divergence aloft, or from storm-produced outflows at the surface. However the lifting occurs, the air cools due expansion in lower pressure, which in turn produces condensation.

In winter, the land cools off quickly, but the ocean keeps the heat longer. The hot air over the ocean rises, creating a low pressure area and a breeze from land to ocean while a large area of drying high pressure is formed over the land, increased by wintertime cooling.

Monsoons are similar to sea breezes, a term usually referring to the localized, diurnal (daily) cycle of circulation near coastlines everywhere, but they are much larger in scale, stronger and seasonal.

Origin and Process of South-West Monsoon

The south-west monsoon travels thousands of kilometers from its birth off the Madagascar coast to Somalia from where it is deflected to India to its retreat to Tibet in September and its final dissipation in Madagascar again — a journey transcending continents, cultures, and different climates.

The south-west monsoon is born due to a high-pressure area called "Mascarenas High." The wind direction at this point of time is southeasterly. The moisture-laden winds from this high-pressure area around Madagascar travel northwards to the African country of Somalia. As soon as they cross the equator, south-easterlies turn right to assume a southwesterly direction.

It is in Somalia that south-west monsoon assumes its true character. Explains Met director S C Bhan, "It is a jet-stream formed in May that brings the south-west monsoon from Somalia to India. Jet streams are relatively strong winds concentrated within a narrow stream in the atmosphere. The Somali jet-stream helps the south-west monsoon gain force and hence it hits the Indian subcontinent with great force."

From Somalia, it covers 2,500 km, 15 km above sea level to come to India. The entire monsoon activity over the world takes place between the latitudes of 30 degrees south and north. In fact, monsoon reaches Southeast Asia before India. Whereas it hits Southeast Asia on May 1, it reaches Andaman and Nicobar Islands around May 15.

Elaborating on the reason why India attracts the south-west monsoon from

Madagascar, B P Yadav, director, India Meteorological Department (IMD) says: "With summer setting over the subcontinent in May, the land starts heating up. The sea/ocean surrounding the subcontinent fails to heat up as fast as the land. As the hot air over the landmass rises, a low-pressure area is formed. The low-pressure area draws massive amount of air from the high-pressure area over the sea to fill the void. The Somali jet stream brings moisture-laden winds from high-pressure area to India. These winds hit India from a south-west direction, hence the name."

Winds that gather moisture over Arabian Sea lash the Western Ghats (mountain ranges along the West coast of India) where some areas receive an average rainfall of 2,000 mm. Winds that gather moisture over Bay of Bengal hit northeastern states by June 1. This further brings rain to West Bengal and Bihar. Both the streams merge over central India to power the monsoon towards Delhi and Jammu.

However, by this time the winds have lost most of their moisture hence north Indian states receive less rain than coastal areas. The last place to be hit by the south-west monsoon in India is west Rajasthan where it does not reach before July 15.

This is not the end. With the temperature dropping in September, a high-pressure area is formed over Tibet known as "Tibetan High." The anti-cyclone movement over this area pushes the winds coming from Bay of Bengal to assume an easterly direction. Hence, "Tibetan High" creates an easterly tropical jet, which takes the winds back to the coast of Madagascar where it finally sinks into "Mascarenas High" — the place of its inception.

South-West Summer Monsoon

The southwestern summer monsoons occur from June through September. The Great Indian Desert (Thar Desert) and adjoining areas of the northern and central Indian Subcontinent heats up too much during the hot seasons of summer. This causes a low pressure area over the northern and central Indian subcontinent. To fill up this void, the moisture-laden winds from the Indian Ocean rush in to the subcontinent. These winds, rich in moisture, are drawn towards the Himalayas, creating winds blowing storm clouds towards the subcontinent. However the Himalayas act like a high wall and do not allow the winds to pass into Central Asia, forcing them to rise. With the gain in altitude of the clouds, the temperature drops and precipitation occurs. Some areas of the subcontinent receive up to 10,000 mm of rain.

The southwest monsoon is generally expected to begin around the middle of June and dies down by September. The moisture-laden winds on reaching the southernmost point of the Indian peninsula, due to its topology, become divided into two parts:

- *Arabian Sea Branch of the SW Monsoon*
- *Bay of Bengal Branch of the SW Monsoon*

The Arabian Sea Branch of the SW Monsoon first hits the Western Ghats of the coastal state of Kerala, India and hence Kerala is the first state in India to receive rain from the South-West Monsoon. This branch of the monsoon moves northwards along the Western Ghats giving rain to the coastal areas

west of the Western Ghats. It is to be noted that the eastern parts of the Western Ghats do not receive much rain from this monsoon as the wind does not cross the Western Ghats.

North-East Monsoon (Retreating Monsoon)

Around September, with the sun fast retreating south, the northern land mass of the Indian Subcontinent begins to cool off rapidly. With this air pressure begins to build over northern India. The Indian Ocean and its surrounding atmosphere still holds its heat. This causes the cold wind to sweep down from the Himalayas and Indo-Gangetic Plain towards the vast spans of the Indian Ocean south of the Deccan peninsula. This is known as the **North-East Monsoon** or **Retreating Monsoon**.

While traveling towards the Indian Ocean, the dry cold wind picks up some moisture from the Bay of Bengal and pours it over peninsular India. Cities like Chennai, which get less rain from the South-West Monsoon, receives rain from the Retreating Monsoon. About 50% - 60% of the rain received by the state of Tamil Nadu is from the North-East Monsoon.

It is worth noting that North-East Monsoon (or the Retreating Monsoon) is not able to bring much rain as the South-West Monsoon.

Southwesterly Monsoon And Ancient Trade Patterns

Harappans were the first mariners from India who had maritime trade relations with countries outside India. They sailed up to the coast of Bahrain, Meluhha, Oman Peninsula, and Mesopotamia using
Monsoon winds and currents, but no evidence is available in this regard.

Greek and Roman mariners were able to reach the Indian coast to carry out extensive maritime trade with the help of monsoon winds. It is clear that the seafarers were not able to see the flow of winds and currents, but felt that there are forces that assist in driving the ship faster than the normal movement. The use of monsoon winds and currents for maritime trade by mariners is less known to all of us. Probably the knowledge of use of monsoon wind and current for maritime trade was only confined to sailors and mariners.

It would not be an exaggeration to state that without the Southwesterly Monsoons the ancient trade with India would have not not developed and flourished. As described in the foregoing paragraphs the Southwesterly Monsoon winds blow in Southwesterly direction during the monsoon periods and in the Northwesterly direction in the other, this greatly aided the ancient Mariners to traverse the Indian Ocean and the Arabian sea to India and back making good use of these winds.

Once the directional pattern of the Monsoon winds was known to Mariners they could effectively reduce the turn over time of their voyages to and fro to India. Prior to the knowledge of these winds, trans Indian Ocean - Arabian sea voyages between Greece, Rome, Mesopotemia and India used to take several months. It was not practical to carry provisions more than that could be carried for a specified duration. Any delays in completing these voyages

meant in aborting such trade voyages midway.

Maritime traders from Egypt, Greece and Rome used to sail through the Red Sea, and along the coast of Oman, prior to crossing the Arabian Sea to reach the Indian ports along the Western Coast.

Once the Moonsoon winds were studied by Hippalus, a voyage started from Red Sea during the summers (i.e the early monsoons of India) could be completed along a West coast port in India in about 40 days. This became possible by using the winds blowing towards the Indian Coast.

Similarly voyages from the Indian Coast to the Mesopotemia, Egyptian Ports, if started in the post monsoon periods (around November) could be successfully completed in shorter periods using the Retreating Monsoon winds. It would have been surprising if the trade would have not increased and flourished, once the stumbling block of voyage time was greatly reduced !

The Arabs and the Portugese further started to trade with India. The voyages of Vasco – da – Gama need no elaboration.

There have been evidences of increased trading activities in the period after Hippalus studied and recorded the Southwesterly Monsoons. Several ports developed along the West coast of India during this period. Evidences in form of Roman Coins and artefacts have been unearthed at such locations. Caskets for carrying Wine and Olive oil from Rome have been unearthed at Chaul - Raigad district, Nevase – Ahmednagar district and Ter in Osmanabad district in Maharashtra (Western India).

A statue of the Roman Sea godess Posedion, has been found in the hinterlands of Maharashtra in the city of Kolhapur. All these artefacts have been dated from a few centuries BC to the first few centuries AD. These findings certainly cannot be considered as coincidences, but in fact are the evidences of increased trading activities between India and the west.

Similar developments of ports took place along the Eastern coast of India. Explorations and excavations at these sites have yielded northern black polished ware (NBP), rouletted ware, knobbed ware, Red and Black ware, Roman and punch mark coins and semi-precious stone beads. All these archaeological findings are traced to be dated as far as 2500 to 2000 BC, if not earlier.

The seafarers of India had knowledge about the sea pertaining to weather, winds, currents, waves, and tides. Their observations were often correct and they succeeded in presenting a general picture of the physical conditions of the Arabian Sea, Bay of Bengal and Indian Ocean.

Information on these early concepts is found in Pali, Sanskrit and Tamil literature and also archaeological excavations, numismatics and paintings.

Trade Between India and Far East

The Arab and Greek mariners set sail with the help of summer monsoon winds and were able to return during the winter monsoon, whereas mariners of Orissa set sail during the winter monsoon and returned during the summer monsoon.

During the period from October to February, monsoon winds and currents flow from the northeast helped ships to sail from Orissa and the east coast of India to Sri Lanka and other Southeast Asian countries. The onward journey during the northeast monsoon can be corroborated with regional festivals like *Kartika Purnima* (full moon day of Kartika in the month of November), symbolizing that traders have a safe journey. This festival has been celebrated by the people of Orissa since a long time and was the day of the commencement of sea voyages. The day is celebrated as *Bali Yatra* (voyage to Bali) throughout Orissa.

Sailors of east coast of India were first to obtain knowledge on the use monsoon winds and currents for maritime trade. Monsoon winds were the main sources driving sailing boats to reach safely to far off countries, without much problem.

Archaeological and historical evidences indicate that sailors of Orissa were aware of the use of monsoon winds and currents for more than 2000 years, if not earlier, for their maritime trade with other parts of India and Southeast Asian countries.

The above study shows that the sailors from Orissa set sail during the northeast monsoon and returned during the southwest monsoon. The winds and currents were favorable during their voyages.

Conclusion

The influence of the Southwesterly monsoon can be predominantly seen on the Indian Subcontinent as well as the Souteast and Far East Asia.

According to experts the monsoon winds in the Indian Subcontinent are existing as long as 9,000,000 years. Since then they have had their influence on the Flora and Fauna in the region. Comparitively their influnce on the mankind is relatively recent but it has certainly influnced mankind a lot. Evidences show that on making correct use of the Southwestly Monsoon and Retreating Monsoon winds, by ancient traders, the trade with and from the Indian Subcontinent flourished.

The Southwestly Monsoons yet continue to influence the region in more than one ways and will continue to do so. What needs to be done is further studies on the Southwestly Monsoon system and how can its energy be optimised to the best use of mankind and the environment.

This article is compiled with the help of several articles and references on the web, and atricles published by Marine Archeoligists of the Indian Oceanographic Institue.