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Surf Science of the Andaman Sea - Part I
A Surfer's Guide to Wind, Water & Waves

Text and images are the original work of **Steven Andrew Martin**

"The Andaman Sea is most peculiar and dynamic, outlined by a shifting volcanic ridge to form a bowl of high-salinity water with mysteriously deep upwellings, internal waves, swirling currents, home to two monsoons, and a world-leader in cyclogenesis"

In Surf Science of the Andaman Sea-Part I we investigate the characteristics of the Andaman region particular to Thailand, including the bathymetry, tides, wave types and directions, and swell windows.

Introduction to Andaman Surf Meteorology

Surf on the Andaman coast comes from a wide-range of sources and directions, and a variety of wave types are generated by particular sets of weather phenomena. This is to say that depending on how, when and where the waves are propagated, the various types of surfing waves which arrive on Thailand's Andaman may coastal differ significantly.

In the widest sense, waves are generated either nearby the coast or far away from the coast. Waves resulting from weather patterns which occur near the Andaman Coast generally create a windsea condition. Windsea refers to waves accompanied by the wind which generated them and results in mixed wave heights. However, the windsea condition may pass, leaving a windswell for several hours or several days. In stark contrast, groundswells generated by weather systems in the Indian Ocean may travel great distances, pass through the The Great Channel (between Banda Ache and The Nicobar Islands) and provide clean, long-period surfing waves. The three most obvious sources of ocean swell activity and associated swell directions relative to the Andaman coast of Thailand are as follows:

- Monsoonal wind flow which propagates southwesterly to westerly windsea and windswell.
- Groundswell generated in the southern or central Indian Ocean which produces southwesterly swells.
- Regional cyclonic activity, including tropical depressions, storms, and cyclones, which may propagate a variety of swell types and directions.

Each type of weather phenomena and its associated swell type and direction create various surfing conditions on the Andaman Coast which may range in size and **'surfability'** from one coastal area to another. Swell direction is highly significant given that the swell window for each province varies considerably. While the provinces north of Phuket are open to a southerly or southwesterly swell direction, the provinces south of Phuket are mainly exposed to westerly swell directions or rarely occurring northerly directions resulting from regional cyclonic activity.

Classification of Storms in Thai Waters

The classification of weather and large storms varies from country to country around the world. For example, a tropical storm in one country may be considered a tropical depression in another country.

Consequently, communication and clarification regarding the exchange of data among various national weather bureaus is of the utmost importance, especially when issuing storm warnings and in terms of public safety awareness.

In Thai waters, the following criteria apply:

- tropical depression is categorized as a weather system which produces winds up to 59 km/hr
- tropical storm produces winds of 60-119 km/hr
- cyclone produces winds of over 119 km/hr

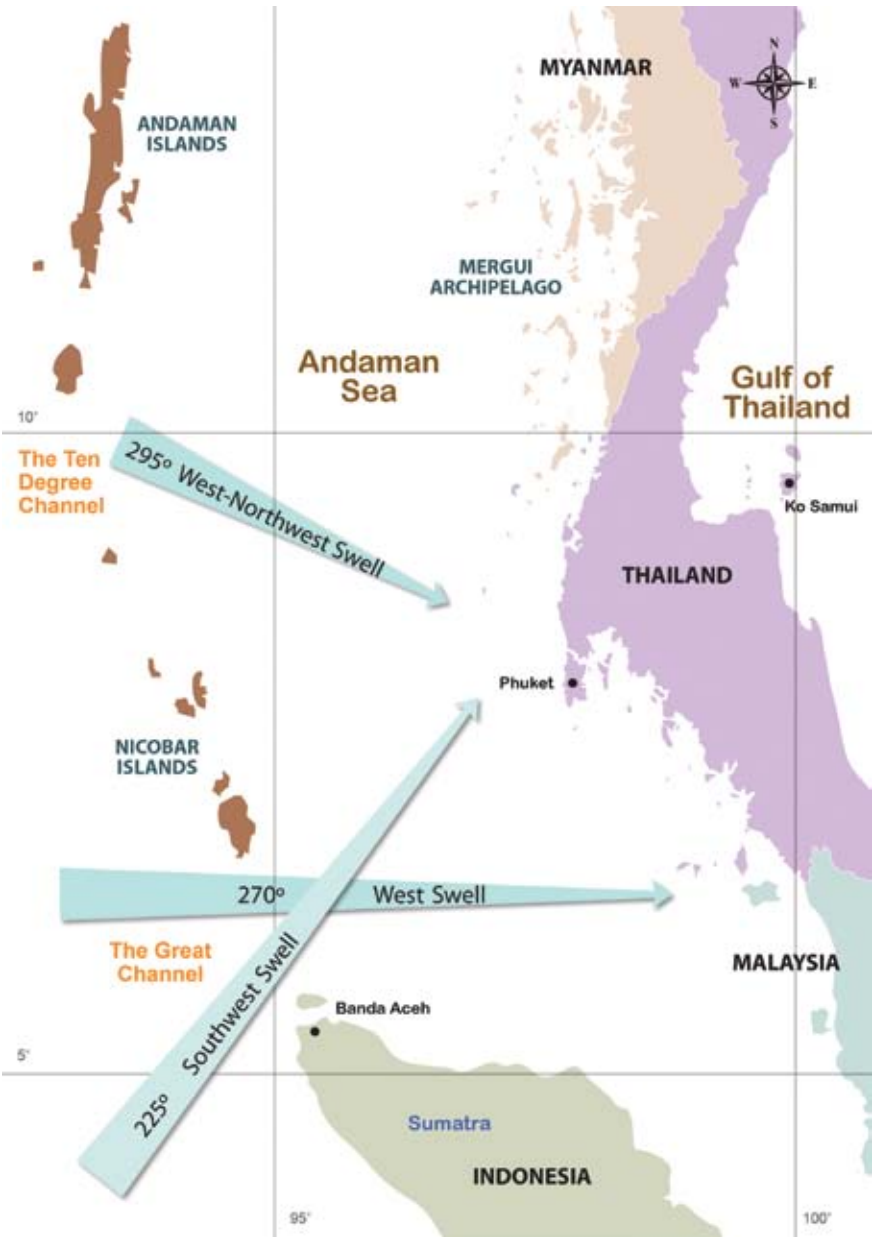
Andaman Coast Swell Windows

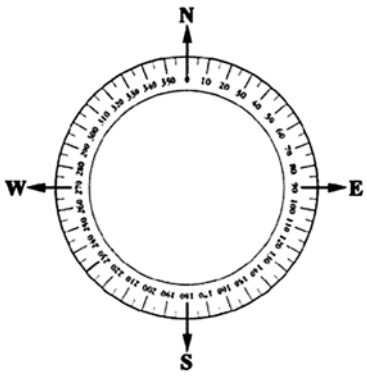
As in navigation, wind and wave directions for meteorology and swell directions follow the numbers of the compass (a 360° circle) where 0/360° is North, 90° is East, 180° is South, and 270° is West. Waves traveling from a particular source or direction are labeled as coming from that direction in terms of the compass relative to the point of arrival. This is to say that if Phuket is the arrival point, we can set the center of the compass over Phuket and measure the direction of the incoming swell.

A particular **'swell window'** suggests the 'openness' of the coast to receive waves traveling from the open sea. The 'openness' of the Andaman Coast to the wave activity generated in the Indian Ocean is characterized by the limitation or the obstruction imposed by Sumatra and Sri Lanka. This is to say that in order for Indian Ocean swells to reach Phuket, they must pass through The Great Channel, a swell window limited from roughly 230 degrees west-southwest through 245 degrees west-southwest. Thus the swell window for Phuket to receive waves from the Indian Ocean is approximately 15 degrees or less.

Primarily a factor of geography, Sumatra blocks or shadows the vast majority of high swell energy occurring in the Indian Ocean from reaching Thailand's Andaman seaboard. Consequently, the surf on Thailand's Andaman Coast is normally just a fraction of that occurring on the South-Western coast of Sumatra (including the Mentawai Islands) which are highly exposed to the wider Indian Ocean.

In a regional context, Thailand's Andaman Coast receives the biggest/best surf from waves generated in the northern Indian Ocean/southern portion of the Bay of Bengal. During regional surf-generating storm activity, including cyclones, the swell window increases to include between 225 degrees southwest through 295 degrees west-northwest, although the Nicobar-Andaman Archipelago form a considerable barrier, forcing waves to pass through The Great Channelor The TenDegree Channel in order to enter the Andaman Sea. Indeed the more westerly the swell direction, the more probable that wave activity can pass through The Great Channel and directly affect the Andaman Coast and the southern provinces of Krabi, Trang, and Satun. Worthy of note, The Great Channel is much deeper and wider as compared to The Ten Degree Channel.





Tides

Tides along Thailand's Andaman Coast are semi-diurnal, meaning there are two high tides and two low tides daily with spring heights of up to approximately 3.6 meters and neap tides down to approximately .6 meter. Generally, the maximum tidal amplitude (the magnitude of change in an oscillating tidal variable) in Phuket is approximately 3 meters; however in some areas of the Andaman Sea, amplitudes can reach as much as 7 meters! Reef breaks along the Andaman Coast are highly **'tide dependent'**, and most require a mid to high tide in order to be 'surfable' (this is to say that on low tide these areas may become exposed reefs). Conversely, waves at most beach breaks become too fat and chubby on high tides and are better surfed on incoming or medium tides—unless of course the waves are BIG, when indeed anything goes!

Andaman Coastal Bathymetry

The bathymetry (seafloor topography) varies at different latitudes along Thailand's Andaman Coast and this greatly affects wave speeds and heights. Waves approaching a particular coast from deep water travel faster and carry more energy and power than waves approaching over shallow water (such as when they are passing over a continental shelf) before reaching the shore. Notably, the deepest water on Thailand's Andaman Coast is found near Phuket; hence for the most part Phuket has the best waves regardless of the fact that provinces to the north have a better swell window to the southern Indian Ocean.

Relationally, as the sea shelf is wider to the north and south of Phuket, the sea depth along the Andaman coast decreases progressively in latitudes north and south of Phuket.

All Andaman provinces have a sea shelf, which is about 108 km wide in the north (Ranong Province), narrows down to 27 km in the middle (Phuket Province) and widens again to about 130 km in the south (Satun Province).

However, offshore islands, such as the Surin Islands of Phang Nga province and Ko Phayam Island in Ranong province have deeper coastal waters compared to the continental coast and may experience somewhat higher significant wave heights.

Andaman Sea Factoids

- The average depth the Andaman Sea is approximately 1,000 meters (3,200 ft), while the western and central areas are particularly deep at 900 to 3,000 meters (3,000–10,000 ft). The northern parts are much shallower due to the silt deposited by the Irrawaddy River, as are the coastal areas of Myanmar and Thailand due the continental shelf.
- At an average salinity of 32 parts per thousand, the Andaman Sea is especially salty. Due to the fresh water entering the sea from the Irrawaddy River in the north, slightly higher salinity occurs in southern areas near Thailand.
- Along with the Nicobar island chain, The Andaman Islands form a natural back-arc basin which defines the Andaman Sea. The western area of the sea is dynamic with seismic activity along a zig-zag north-south line where the seabed demarks the boundary between the Burma plate and the Sunda Plate. Here, as a result of the 2004 Indian Ocean earthquake, the sea floor was uplifted by several meters in some areas. This area is home to the only active volcano connected with the Indian subcontinent.
- Peculiar to the Andaman Sea is the occurrence of 'internal waves', which are essentially underwater waves which can travel across the sea and sometimes surface to form the mysterious ripples recorded by early seafarers in the region. Caused by the mixing of different water temperatures and densities in relation with deep-sea currents, internal waves are comparable to oil and vinegar in a jar: when lightly shaken, a sub-surface wave forms where the different fluid densities meet.
- Swirling deep sea currents change with the monsoon seasons from south-easterly and easterly in winter and south-westerly and westerly in summer. The changes in currents affect sea temperatures and salinity in various parts of the sea.
- The Andaman Sea is known for the genesis of many severe cyclones which traverse the Bay of Bengal. Cyclogenesis is a characteristic weather phenomenon particularly dynamic to the Bay of Bengal and the Andaman Sea. Although cyclones are normally associated with a weather phenomena related to the equator, the Bay of Bengal and the Andaman Sea are potentially energetic for the development of cyclonic storms and account for about seven percent of the total number of cyclones in the world annually (including the infamous Cyclone Nagris which hit Myanmar on May 2, 2008). Surfers watch for epic north-westerly swells either early or late in the surf season!

Stay tuned : in the next issue of TSM, Surf Science of the Andaman Sea—Part II will further explore the particular weather phenomena which propagate surfing waves for Thailand's Andaman Coast.

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