**Quelques textes sur les brises de mer et de terre**

**Sea and Land Breezes**

Winds laden with moisture and rain blow in from the sea across the east Asian land mass in summer while, in winter, dry winds from the interior move out toward the sea. These winds are known locally as the monsoons, a word meaning seasons. Just as there are annual wind direction reversals on a continental scale, there are also daily wind reversals across the land-sea boundary on a regional scale. The wind which moves inland daily with cool moist air is called the sea breeze, and that which moves seaward is the land breeze.

The ancient Greeks were the first to write extensively of the sea-land breeze rhythm. Homer, in the Odyssey, related that both Odysseus and Telemachus set sail after dark to take advantage of the land breeze blowing out to sea. Plutarch spoke of the Athenian commander Themistocles using the onset of the sea breeze, which produced rough seas in the Bay of Salamis, to defeat the Persian fleet. Persian ships could not be maneuvered in the rough seas as well as the smaller ones that were used by the Greeks, thus giving the Greeks the decisive tactical advantage.

Aristotle in Problemata and Theophratus in On the Winds attempted to describe the genesis and nature of the land and sea breezes. They both considered the land breeze to be the dominant partner and the sea breeze only the reflection of the land breeze off obstacles such as islands and coastal hills. They believed that the alternating current, as they called the sea breeze, could not blow across the open sea where no obstacles from which to rebound existed.

A True Child of the Sun

On the rugged Greek coast, such conclusions as to the relative strength of the land and sea breezes are quite justifiable due to the enhancement of the land breeze and weakening of the sea breeze by the seaward slope of the land. In general, however, the sea breeze is the stronger of the two winds especially among those tropical coasts flanked by cold ocean currents, for the sea breeze is a true child of the sun. The genesis of the sea-land flow pattern depends upon the formation of a pressure gradient across the land-sea boundary with the higher pressure located over the sea. This gradient of pressure is greatly dependent not only on the temperature difference between the land and sea surfaces but also is influenced by the strength and direction of the large-scale wind patterns, roughness of the terrain, curvature of the coast and moisture conditions over the land.

Ideally, the picture develops this way. As the day dawns, coastal skies are cloudless or nearly cloudless, and the wind induced by large-scale weather patterns is light. As the sun rises, increased solar energy heats the surface of the earth which, in turn, heats the lowest layers of the atmosphere. At sea, however, the radiant energy received is rapidly dispersed by a combination of turbulent mixing due to winds. waves, currents and the capacity of the water to absorb great quantities of heat with only slight alteration of its temperature. Thus. the air over land warms faster than that over the sea surface. Since warmer air is lighter air, the pressure over land becomes less than that over water, the average value of this difference being, during the sea breeze regime, about 1 millibar. [1013 millibars = 1 atmosphere of pressure]

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|  | 1. Warm air over land rises 2. Sea Breeze moves inland as a mesoscale cold front 3. Cumuli develop aloft and move seaward 4. Upper level return land breeze 5. Cool air aloft sinks over water 6. Sea Breeze (meso-cold) Front |

A few hours after sunrise, the pressure gradient will have built up sufficiently to allow the sea breeze to begin moving inland. As the sea breeze moves inland, the cooler sea air advances like a cold front characterized by a sudden wind shift, a drop in temperature and a rise in relative humidity. A temperature drop of 2 to 10 C degrees (3.6 to 18 F degrees) within 15 to 30 minutes is not an uncommon occurrence as the sea breeze front advances.

Thus, in the tropics, the sea breezes make coastal areas more comfortable and healthy for human habitation than the inland regions. For this great service, Europeans overcome by the tropical heat in Africa have bestowed on the sea breeze a special name -- The Doctor -- and welcomed its coming.

From the time of the sea breeze front passage until late afternoon. the wind will blow inland at speeds of 13 to 19 kilometres per hour (8 to 12 miles per hour), occasionally as strong as 40 kilometres per hour (25 miles per hour). At first, the wind blows perpendicular to the shore, but as the day wears on, friction and Coriolis effects act to veer the wind until it parallels the coastline. The landward penetration of the sea breeze reaches 15 to 50 kilometres (9 to 30 miles) in the temperate zones and 50 to 65 kilometres (30 to 40 miles) in the tropics. By late afternoon, the strength of the sea breeze slowly diminishes as the influx of solar energy lessens. The decay of the circulation pattern occurs first at the shoreline and then proceeds further inland.

The Land Breeze

As the sun sets, cooling begins along the surface of the land and sea. Like daytime heating, cooling occurs at different rates over water and land. The rapidly cooling land soon has a higher air pressure over it relative to that over the sea, and the air begins to flow down the pressure gradient seaward. This is the land breeze. It too is influenced by the roughness of the coastline, strength of the large-scale winds, and coastal configuration. Unlike the sea breeze, the land breeze is usually weaker in velocity and less common. The land breeze is often dominant for only a few hours and its direction is more variable. Nevertheless, the land breeze can penetrate the marine atmosphere for 10 kilometres (6 miles) seaward.

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|  | 1. Cool air over land sinks 2. Land Breeze moves out over water 3. Relatively warmer water heats air which then rises 4. Upper level return sea breeze 5. Cool air over land sinks |

Climatology of the Sea and Land Breeze

The sea breeze is most common along tropical coasts, being felt on about 3 out of 4 days. The warmer temperatures, increased solar radiation and generally weaker prevailing winds in the low latitudes promote the development of the sea breeze. In general, the climatic significance of the sea breeze decreases with latitude. In temperate regions, it is generally a phenomenon of late spring and summer when atmospheric conditions (higher temperatures, weaker large-scale winds) are most favourable to the formation of the thermally induced, sea-land circulation system.

The land breeze occurs less frequently. Along coasts with steep shorelines or volcanic island coasts, however, it may be the dominant partner with speeds in excess of 32 kilometres per hour (20 miles per hour). The land breeze may also occur in the temperate regions during the cold season, especially when a warm current flows along the coast.

Lake-Land Breezes

Lake may also develop a similar local wind circulation pattern. Here the inland moving wind is known as the lake breeze. Lake breezes are quite common in late spring and summer, for example, along the shorelines of the Great Lakes, providing local residents with a place of refuge during hot, humid summer days.

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<http://www.islandnet.com/~see/weather/elements/seabrz.htm>

**Recherche sur les types de temps associes aux brises de mer. Une méthode d’analyse par téledetection**

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Résumé

Les circulations de brise de mer favorisent l’apparition de types de temps relativement frais et humides mais le plus souvent ensoleillés sur les espaces côtiers par rapport aux régions intérieures. Une méthode d’identification des fronts de brise par télédétection a été appliquée à l’Europe de l’Ouest et au nord-est du Brésil, afin d’en calculer la fréquence d’apparition et la distance préférentielle de pénétration dans les terres aux heures chaudes de la journée. Le suivi des fronts de brise a été effectué durant la saison chaude en Europe occidentale (mai à septembre 2000) et la moins arrosée dans le Nord-Est du Brésil (septembre à décembre 2000). La distance de pénétration des fronts de brise varie en fonction de l’exposition de la côte aux vents dominants, en Europe comme au Brésil. Cependant, la succession de situations météorologiques variées impose des configurations diverses d’un mois à l’autre en Europe de l’Ouest, tandis de la régularité des alizés fait ressortir une plus grande permanence, dans l’espace et dans le temps, de la localisation des fronts de brise au nord-est du Brésil.

Introduction

Brise de mer et types de temps : rappels et quelques particularités dans l’ouest de la France

Mécanismes et observations

Brise de mer et télédétection

Données et méthodes

La distribution spatio-temporelle des fronts de brise

Autour de la Manche

Au nord-est du Brésil

Fronts de brise de mer, types de circulations et gradients thermiques terre-mer

Autour de la Manche : irrégularité des brises de mer liée aux faits circulatoires extra-tropicaux

Alizé et brise de mer au nord-est du Brésil : une interaction marquée par la régularité

Conclusion

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