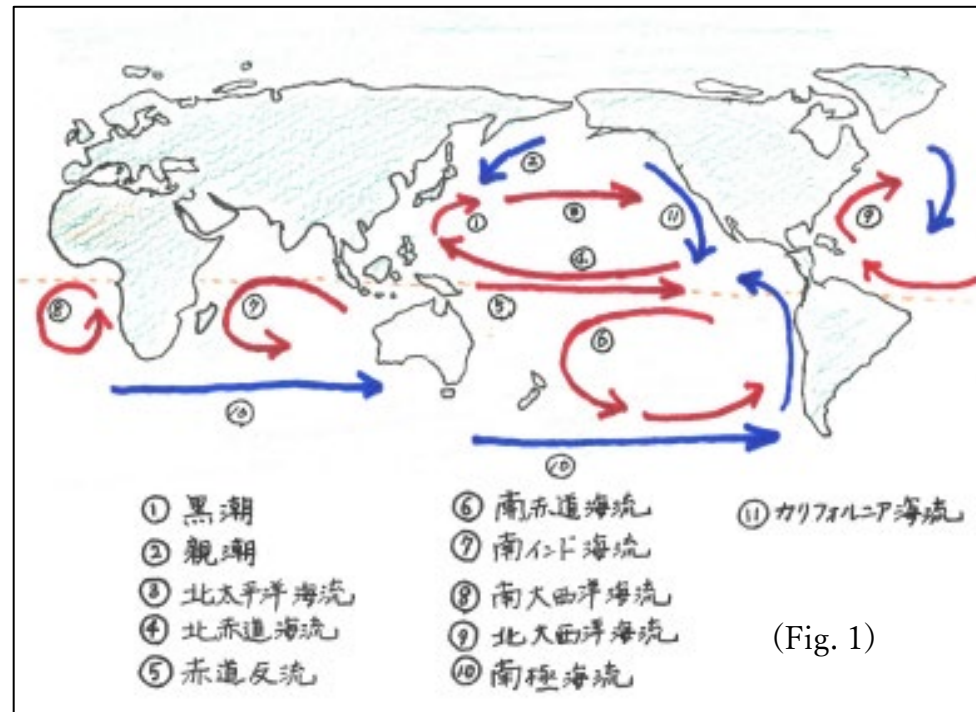


Principle 3 The ocean is a major influence on weather and climate.

1 | Water in the ocean flows in pre-determined directions

Water in the ocean is constantly on the move, and the pre-determined directions in which it flows are called “ocean currents.” Depending on the seawater temperature, ocean currents are divided into “warm currents,” which are warm ocean current, and “cold currents,” which are cold ocean currents.



We will examine the main ocean currents around the world. Please look at Figure 1. As shown in the Figure, warm ocean currents from the equatorial region and cold ocean currents from the north and south pole regions flow around the world. Ocean currents share the same characteristics in terms of regularity. There is a symmetry

between the two hemispheres with a dividing line at the equator, so that ocean currents circulate in a clockwise rotation in the northern hemisphere and in an anti-clockwise rotation in the southern hemisphere. Furthermore, these circulations are asymmetrical in an east-west orientation, with the central point of the circulation diverging to the west from the center of the respective ocean.

How about the seas around Japan? The islands of Japan are enclosed by the ocean, with warm ocean currents flowing from the south, and cold ocean currents flowing from the north. Please look at Figure 2. In the Sea of Japan, the warm current is the Tsushima Current and the cold current is the Liman Current. In the case of the Tsushima Current, a branch of the Kuroshio Current enters the Sea of Japan through the Tsushima Strait, which flows north along the coast of the Japanese archipelago. Part of this continues to flow beyond the Mamiya Strait, going north to Siberia. The ocean current is then cooled, before flowing south to the Sea of

Japan as the Liman Current. This circulation of ocean currents take place all over the world.

2 | Water in the sea impacts precipitation and air temperature

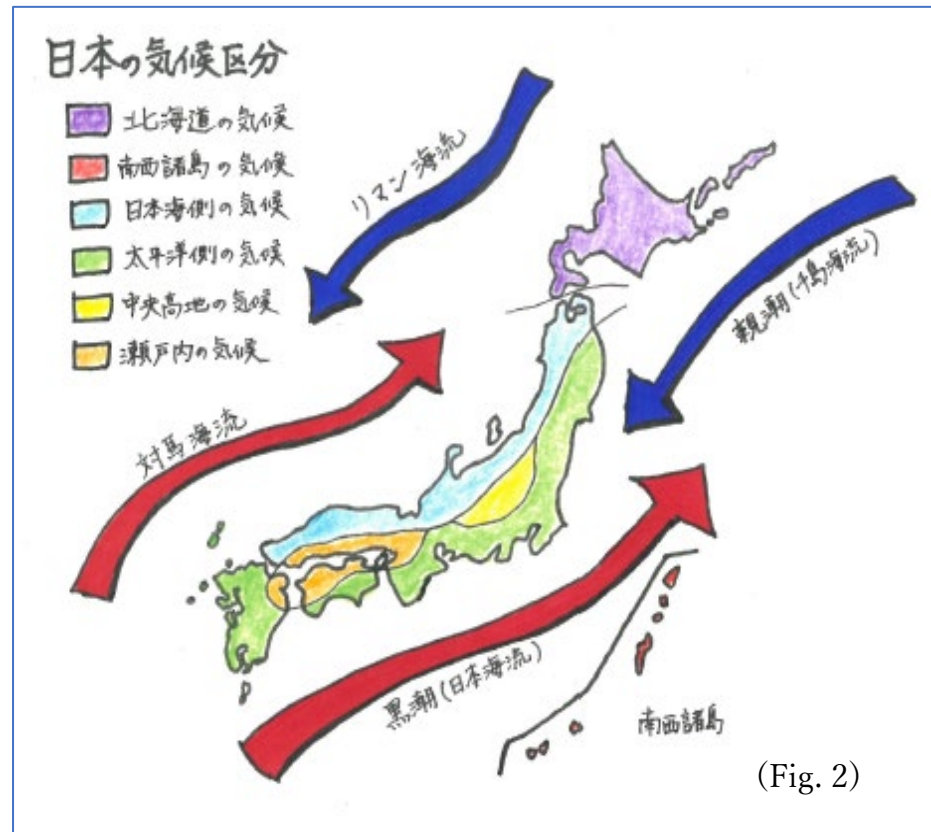
The sea surface temperature in ocean currents rises and falls. When the temperature of the sea surface rises, evaporation from the sea surface speeds up, which conveys a huge amount of water vapor to enter the atmosphere. This water vapor forms lots of cumulonimbus clouds, which cause heavy rain. Lately, the seawater temperature has been rising and falling starting at the international date line near the equator in the Pacific Ocean to the coast of South America. This has led to more rainfall than normal at some times, and less than normal at other times. Also, days with high air temperatures are more frequent, but, conversely, there are longer periods when the air temperature does not rise so high.

In this way, we can see that the temperature of water in the sea has a huge impact on atmospheric conditions such as precipitation and air temperature.

3 | Climate is connected to the flow of water

“Climate” means the typical weather conditions occurring in the atmosphere around the Earth, including air temperature, precipitation and atmospheric pressure. The energy source that maintains these atmospheric conditions is sunlight that reaches the Earth from the Sun. Light from the Sun is absorbed by the sea and the ground, which then warm the atmosphere. The Earth is covered with an abundance of water, as it is called the “Water Planet.” The sunlight absorbs into the sea to evaporate water creating water vapor. This water vapor coagulates in the atmosphere, forming clouds. This releases heat that warms the atmosphere. When the clouds develop, they release rain and snow. The process by which water moves from the sea to the atmosphere and back to the sea via the land is an important factor in the definition of climate.

Please look at Figure 2. The warm currents that are flowing along the southern coast of Japan are the Kuroshio Current (Japan Current), which has one of the strongest flows in the world, and the Tsushima Current, which will latter split off. Also, the cold current on the Sea of Japan side is the Liman Current, which flows from the coast of Siberia, while the cold current on the Pacific Ocean side is the Oyashio Current (Kuril Ocean Current)



that flows from the Kuril Islands. These ocean currents impact the climate of Japan through changes in daily weather.

Japanese-English translation for words and terms on Figure1,2

| Japanese | English translation |
|-------------|----------------------------------|
| ① 黒潮 | ① Kuroshio Current |
| ② 親潮 | ② Oyashio Current |
| ③ 北太平洋海流 | ③ North Pacific Current |
| ④ 北赤道海流 | ④ North Equatorial Current |
| ⑤ 赤道反流 | ⑤ Equatorial Countercurrent |
| ⑥ 南赤道海流 | ⑥ South Equatorial Current |
| ⑦ 南インド海流 | ⑦ South Indian Ocean Current |
| ⑧ 南大西洋海流 | ⑧ South Atlantic Ocean Current |
| ⑨ 北大西洋海流 | ⑨ North Atlantic Ocean Current |
| ⑩ 南極海流 | ⑩ Antarctic Circumpolar Current |
| ⑪ カリフォルニア海流 | ⑪ California Current |
| 日本の気候区分 | Climate zones in Japan |
| 北海道の気候 | Hokkaido climate zone |
| 南西諸島の気候 | Ryukyu Islands climate zone |
| 日本海側の気候 | Sea of Japan side climate zone |
| 太平洋側の気候 | Pacific Ocean side climate zone |
| 中央高地の気候 | Central highlands climate zone |
| 瀬戸内の気候 | Setouchi climate zone |
| リマン海流 | Liman Current |
| 対馬海流 | Tsushima Current |
| 親潮 (千島海流) | Oyashio Current (Kuril Current) |
| 黒潮 (日本海流) | Kuroshio Current (Japan Current) |
| 南西諸島 | Ryukyu Islands |