

エルニーニョの熱力学 (1)

海面熱交換と水温の垂直断面構造

El Niño Thermodynamics (1)

Heat exchange at ocean surface and thermal structures in Pacific Ocean

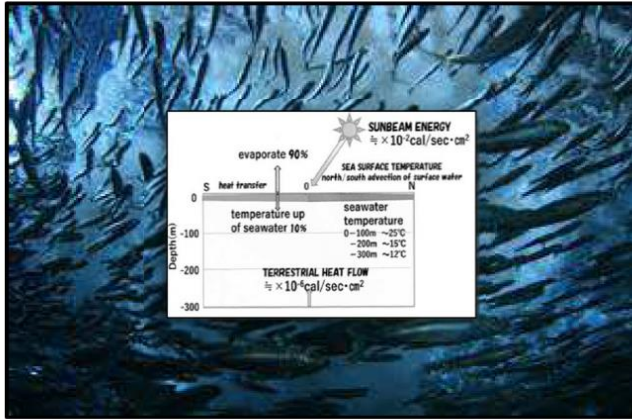


Fig.1 Sunbeam energy is convected in mixed surface layer under sea (Nakajin, 2017).

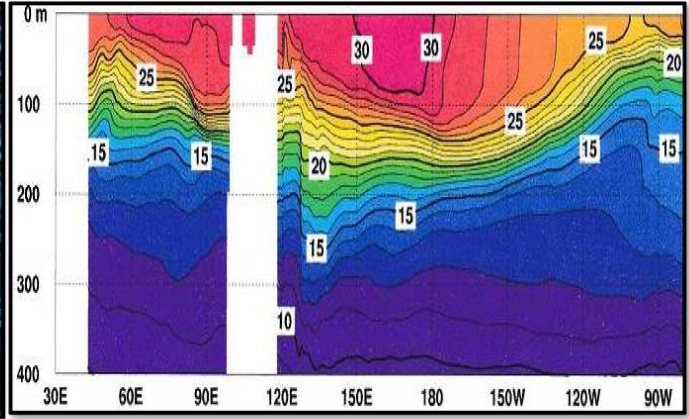


Fig.2 Temperature along from Indian Ocean to Pacific Ocean in December, 2018 (Japan Meteor. Agency,

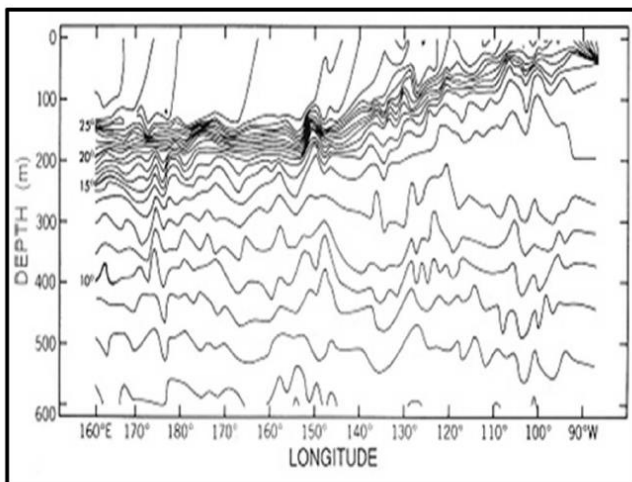


Fig.3 Temperature along the equator in the Pacific Ocean in 1963 (Colin et al., 1971).

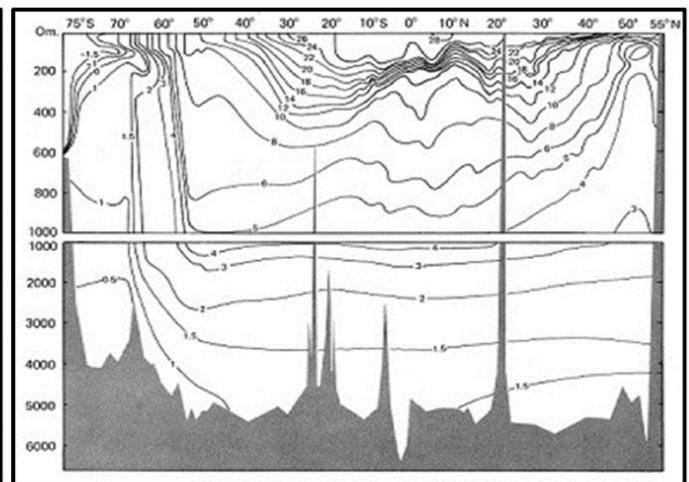


Fig.4 Temperature along approximately 160°W in the Pacific from Antarctic to Alaska (Reid, 1965).

The depth by which a sunbeam enters into an undersea is ten meters at most. Its energy is convected in the surface mixed layer under surface of the sea (Fig.1). The solar radiation amount is 10,000 times of the terrestrial heat flow amount. The thermal capacity of the sea is 3118 times of the atmosphere. It's difficult for a sea to become warm and it's difficult to cool.

Warm seawater flows into a surface mixed layer in the Pacific Ocean equator east at El Niño. When the heat touches the atmosphere, the sky changes it to swell in 15 kilometers of troposphere and the weather which is diffused and is whole ball-like at a stroke. I can think this a little heat and material transportation are controlling the climate.

(Water depth 200m is 1/31,000 of 6378 km of radius of the earth)

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太陽光線が海中に入り込む深さは、たかだか数十メートルで海面下の表層混合層内で対流する。太陽放射熱流は、地殻熱流量の1万倍で、その90%は蒸発作用に10%が海水昇温に使われる。

海水の熱容量は大気の3118倍で、暖まりにくく冷めにくい。エルニーニョ時に太平洋赤道東部の表層混合層(水深約200m)に温かい海水が流れ込む。その熱が大気下部に触れると一挙に15キロ上空の対流圏にまで膨脹・拡散し全球的気象に変える。このわずかな熱や物質の輸送が気候をコントロールしていると考えられる(水深200mは地球半径6378kmの31,000分の1である)。

海面熱交換と垂直断面の解説。

図1. 海面の熱交換(中陣, 2017).

図2. インド洋-太平洋赤道の断面(2018年

12月;JMA). エルニーニョに突入!

図3. 1963年, 太平洋赤道に沿う東西断面

(Colin, et al., 1971).

図4. 南極からアラスカに沿う160°E子午

断面(Reid, 1965).



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