Increasing Polar Sea Ice Area Secular Balance from 1979 through 2007 from Satellite Observations

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ABSTRACT

Since 1979, the satellites of the Defense Meteorological Satellite Program (DMSP) have been acquiring cloud-masked passive microwave images used to determine sea ice extent. Algorithms developed at the NASA Goddard Space Flight Center with these observations have been providing estimates of the size and extent of the sea ice cover and the energy exchanges between the ocean and atmosphere. Recent studies (e.g., Comiso et al., 2008) have provided empirical evidence for the secular and interannual variations of the polar sea ice area. These studies have shown that the polar sea ice area has been increasing by 24,311 ± 5,359 km²/yr from 1979 through 2007, during the period of satellite observations. Forcing on sea ice area (growth and decay) comes from solar radiation, and secular trends, lending insight for appraisal of the forcing mechanisms. Recently, (2008) Team) developed at the NASA Goddard Space Flight Center with these observations. Microwave data globally on a daily basis. Algorithms (Bootstrap and NASA TEAM) algorithm, from the northern (Arctic) and southern hemisphere (Cavalieri et al., 1997). This has again been brought to attention given the consistent with results of a global circulation model with gradual CO₂ forcing. The variations in Polar Sea ice area are consistent with the 60-yr solar variation - length-of-day, and the 120-day cycle. The short-term maxima/minima variations in Polar sea ice area indicate the polarity of the current long-term trends will likely reverse. This is again consistent with the 60-yr solar variation length-of-day modulation of global surface air/sea temperatures and atmospheric circulation.

Conclusions

The Secular Trends of Polar Sea Ice Area from 1979 through 2007

Arctic Sea Ice Area: 197998 ± 3587 km²

Antarctic Sea Ice Area: -2431 ± 5359 km²

Polar Sea Ice Area: +6133 ± 2332 km²

Variations in Polar Sea Ice Area from 1979 through 2007

1. The Antarctic sea ice area seasonal maxima are increasing and the seasonal minima are decreasing.

2. The Antarctic sea ice area seasonal maxima are decreasing and the seasonal minima are increasing.

Deduction

The variations in Polar Sea ice area are consistent with the 60-yr solar variation - length-of-day modulation of global surface air/sea temperatures and atmospheric circulation.

References

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Deduction

The short-term maxima/minima variations in Polar sea ice area indicate the polarity of the current long-term trends will likely reverse. This is again consistent with the 60-yr solar variation length-of-day modulation of global surface air/sea temperatures and atmospheric circulation.

Variations in Polar Sea Ice Area from 2003 through 2008

1. The Arctic sea ice area seasonal maxima is increasing and the seasonal minima are decreasing.

2. The Antarctic sea ice area seasonal maxima are decreasing and the seasonal minima are increasing.

Deduction

The variations in Polar Sea ice area are consistent with the 60-yr solar variation - length-of-day modulation of global surface air/sea temperatures and atmospheric circulation.