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全球纬向平均大气环流基本模态年代际变化的凝聚小波分析

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The coherent wavelet analysis of interdecadal variability of basic mode of global zonal-mean atmospheric circulation

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摘要

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摘要 应用1871—2008年NCEP / NCAR月平均再分析资料,研究了1948—2008年期间全球纬向平均大气环流基本模态的年代际变化.小波凝聚谱的结果表明全球纬向平均大气环流基本模态存在显著的20年左右周期的年代际变化.小波凝聚位相的结果清楚地显示了纬向平均大气环流基本模态的变化顺序.在20年左右的年代际变化时间尺度上,全球纬向平均温度超前纬向平均位势高度2个月,同时超前纬向平均流10个月出现变化;全球纬向平均位势高度又超前纬向平均流8个月出现变化.全球温度上升(下降),将使高纬度的纬向平均位势高度降低(升高),中低纬度的纬向平均位势高度升高(降低);进而使得中高纬和热带的纬向平均西风加(减)速或东风减(加)速,同时使极地和副热带的西风减(加)速或东风加(减)速.20世纪70年代末期以来全球显著增暖的异常信号最早出现在南半球对流层顶附近,其次出现在南半球对流层低层、北半球对流层顶附近和北半球对流层低层.

关键词 全球增暖, 大气环流基本模态, 年代际变化, 凝聚小波

Abstract: The interdecadal variability of basic mode of global zonal-mean atmospheric circulation was analyzed with the monthly reanalysis data provided by NCEP/NCAR. The results indicated that the basic mode of global zonal-mean atmospheric circulation has significant interdecadal variability with a period of 20 a. On the time scale about 20 a, the change of zonal-mean temperature leads the zonal-mean geopotential height about 2 months, and leads the zonal-mean flow about 10 months. The change of zonal-mean geopotential height leads the zonal-mean flow about 8 months as well. The increase (decrease) of zonal-mean temperature will cause the zonal-mean geopotential height descending (ascending) at high-latitude area and ascending (descending) at mid- and low-latitude area; then further causes the zonal-mean westerly accelerating (decelerating) at mid- and high-latitude and tropics, and westerly decelerating (accelerating) at polar regions and subtropics. On the 20 a time scale, the signals of significant global warming from the end of 1970s emerge initially at the tropopause of the South Hemisphere. The lower troposphere over the South Hemisphere is warmed up subsequently, as well as the lower troposphere and the tropopause of the North Hemisphere.

Keywords Global warming, Basic mode of global zonal-mean atmospheric circulation, Interdecadal variability, Coherent wavelet analysis

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