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中国夏季淮河和江南梅雨期降水异常年际变化的气候背景及其比较

A comparative study of the interannual variation of summer rainfall anomolies between the Huaihe Meiyu season and the Jiangnan Meiyu season and their climate background.

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中文关键词：　淮河梅雨　江南梅雨　年际变化　阻塞高压　海温异常

英文关键词：Huaihe Meiyu　Jiangnan Meiyu　Interannual variation　Blocking high　Sea surface temperature anomaly

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中文摘要：

基于中国160站57年（1951—2007年）的月降水量、NCEP/NCAR 再分析资料和哈得来中心的海表温度（SST）资料，将江淮梅雨分成淮河梅雨和江南梅雨，分别对这两部分的夏季梅雨期（6—7月）降水量进行了分析，并加以比较。结果表明：淮河和江南梅雨期的降水量存在明显的年际变化，但都没有显著的长期线性趋势；然而，从20世纪90年代末开始，淮河梅雨有显著增加的趋势，而江南梅雨则显著减少。在年际变化的时间尺度上，对应于淮河梅雨的多雨年，大气环流的异常表现为中高纬度的乌拉尔山东部和鄂霍次克海东部地区明显的双阻塞高压型(双阻型)分布，而西太平洋副热带高压(副高)的变化并不显著；副热带东亚地区高空的西风急流轴略有南移，在淮河流域上空形成了显著的西风异常，这使得急流入口区次级环流的异常上升支恰好位于淮河附近，同时北方的冷空气南下与副高西侧的西南气流交汇于淮河流域，这些都有利于降水集中在淮河区域。对应江南梅雨的多雨年，大气环流异常也表现出中高纬度的双阻型分布，但该双阻型的位置较淮河梅雨双阻型的位置明显偏西，特别是鄂霍次克海附近的阻塞高压；同时，西太平洋副高显著加强西伸，加之副热带东亚西风急流轴显著加强南移，从而在黄海到长江以南的大范围地区形成了显著的西风异常，由此引发的急流入口区次级环流的异常上升支主要位于长江以南地区，并且菲律宾附近的反气旋异常增强，使得北方的冷空气与副高西侧的西南气流交汇于江南流域，因此有利于降水集中在江南地区。进一步针对海温的分析表明，北太平洋白令海附近的海温是影响淮河梅雨的关键区，从前冬开始这一区域的正海温异常往往导致中国夏季淮河梅雨的增加；而对应江南梅雨的正异常，菲律宾附近的海温在同期夏季有显著的正异常，研究还发现该海温异常可能与前冬到前春赤道东印度洋附近的正海温异常有关。

英文摘要：

Based on monthly rainfalls of the 160 China stations, the NCEP/NCAR reanalysis dataset and the HadISST1 dataset for 1951-2007, the generally considered Meiyu is divided into the Huaihe Meiyu and the Jiangnan Meiyu according to the location of maximum precipitation. A comparison study is then performed between these two Meiyu components for the June-July mean situation. It shows that both the Huaihe Meiyu and the Jiangnan Meiyu are characterized by obvious interannual variability. In addition, the Huaihe (Jiangnan) Meiyu underwent significant increased (decreased) trend since the late 1990s although no significant general trend is found for the period 1951-2007. The circulation features associated with the two Meiyu components are then investigated through composite analyses. It reveals that when the Huaihe Meiyu is anomalously strong, the geopotential height field is characterized by double blockings over the midlatitudes, which are located to the east of the Urals and to the east of the Okhotsk Sea, respectively. In contrast, the variation of the western Pacific subtropical high (WPSH) is weak and insignificant. At upper troposphere, the East Asian jet stream shifts southward slightly, with weak westerly anomalies located just above the Huaihe valley, which may cause anomalous ascending motion in the Huaihe valley through the secondary circulation at the entrance of the jet stream. In addition, the anomalous low-level convergence zone induced by the cold northerlies from the north and the warm southwesterlies from the west side of the WPSH are also located around this area. Therefore, all of these circulation features favor more precipitation in the Huaihe valley. When the Jiangnan Meiyu is anomalously strong, the midlatitude geopotential height field is also characterized by double blockings, with the locations extending much westward especially for the one around the Okhotsk Sea. Meanwhile, the WPSH is anomalously strong and also extends westward, with the anomalous positive center around north of Philippines. This implies the amplification of the anticyclone around Philippine, which favors the convergence around south China. On the other hand, the East Asian jet stream shifts much southward compared with the Huaihe Meiyu situation, which may cause anomalous ascending motion around south China through the secondary circulation at the entrance of the jet stream. Therefore, these circulation features favor more precipitation in south China, inducing the Jiangnan Meiyu to become strong. The further analyses on the sea surface temperature (SST) show that the SST anomalies around the Bering Sea may play a key role in the variation of the Huaihe Meiyu. Positive SST anomalies in this area commencing from the preceding winter (DJF) to the simultaneous Meiyu period (JJ) are usually accompanied with a strong Huaihe Meiyu event. As to the Jiangnan Meiyu, it is significantly related to the simultaneous SST anomalies around Philippines, which may in turn be associated with the preceding SST anomalies around the eastern equatorial Indian Ocean.

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