THUR 18 JAN

11:45 A.M.
15.13 THE VARIABILITY OF WINTERTIME PRECIPITATION IN THE NORTHERN COAST OF EGYPT AND ITS RELATIONSHIP WITH THE NORTH ATLANTIC OSCILLATION. Y. Y. Hafez, Cairo Univ., Giza, Cairo, Egypt; and H. M. Hassanean

10:30 A.M. SESSION 16: Continued (Parallel with Session 15 & J1)

16.5 PAPER WITHDRAWN

10:30 A.M.
16.6 VARIABILITY AND TRENDS IN THE HYDRO-CLIMATOLOGY OF THE MAJOR EURASIAN ARCTIC DRAINAGES. Andrew J. Etringer, CIRES/Univ. of Colorado, Boulder, CO; and M. C. Serreze, M. P. Clark, R. G. Barry, and D. H. Bromwich

10:45 A.M.
16.7 TROPICAL CYCLONE PRECIPITATION AND DRY SPELL MITIGATION. Byron E. Gleason, NOAA/NESDIS/NCDC, Asheville, NC; and D. R. Easterling

11:00 A.M.
16.8 VEGETATION AND DROUGHT MONITORING OF THE MONGOLIA USING SATELLATE AND METEOROLOGICAL DATA. Bayarjargal U. Yunden, Jacob Blaustein International Desert Research Institute, Sede Boqer, Midrashat, Negev, Israel

11:15 A.M.
16.9 THE CONTRAST OF STRUCTURE AND ANALYSIS OF CAUSE FOR CHINA¡¯S TEMPERATURE FIELDS IN TWO PERIODS DURING THE LAST 100 YEARS. Zhihong Jiang, Nanjing Institute of Meteorology, Nanjing, Jiangsu, China; and Q. Tu

11:30 A.M.
16.10 RESEARCH ON LFV OF GLOBAL AND SOUTH-NORTH MEAN TEMPERATURE IN LAST 150 YEARS. Zhihong Jiang, Nanjing Institute of Meteorology, Nanjing, Jiangsu, China; and Q. Tu and N. Shi

12:00 P.M. LUNCH BREAK

1:30 P.M. JOINT SESSION J1: Continued (Parallel with Session 15)

1:30 P.M.
J1.15 LIMITS TO THE AEROSOL INDIRECT RADIATIVE FORCING DERIVED FROM OBSERVATIONS OF SHIP TRACKS. James A. Coakley, Jr., Oregon State Univ., Corvallis, OR; and C. D. Walsh

1:45 P.M.
J1.16 A COMPARISON OF SURFACE OBSERVATIONS AND ECHAM4-GCM EXPERIMENTS AND ITS RELEVANCE TO THE INDIRECT AEROSOL EFFECT. Beate G. Liepert, Lamont-Doherty Earth Observatory of Columbia Univ., Palisades, NY

THUR 18 JAN

J1.17 PAPER WITHDRAWN

2:00 P.M.
J1.18 CHANGES IN THE VERTICAL TEMPERATURE STRUCTURE ASSOCIATED WITH CARBONACEOUS AEROSOLS. Yang Zhang, Univ. of Michigan, Ann Arbor, MI; and J. E. Penner, C. C. Chuang, B. D. Santer, and K. Taylor

1:30 P.M. SESSION 15: Continued (Parallel with Session J1)

1:30 P.M.
15.14 ON INTERGYRE DYNAMIC COMMUNICATION. Huijun Yang, Univ. of South Florida, St. Petersburg, FL

1:45 P.M.
15.15 ARCTIC OSCILLATION AND VARIATIONS IN WINTERTIME JETSTREAMS. Julian X. L. Wang, NOAA/OAR/ARL, Silver Spring, MD

2:00 P.M.
15.16 A NON-LINEAR RESPONSE OF THE ANTARCTIC OSCILLATION TO STRATOSPHERIC OZONE DEPLETION. David M. H. Sexton, UK Met Office, Bracknell, Berks., UK

2:15 P.M.
15.17 A STUDY OF ARCTIC OSCILLATION INDUCED BY A POSITIVE FEEDBACK BETWEEN THE POLAR VORTEX AND BAROCLINIC INSTABILITY. H. L. Tanaka, Univ. of Tsukuba, Tsukuba, Japan; and H. Tokinaga

2:30 P.M.
15.18 THE ARCTIC FRONTAL ZONE AS SEEN IN THE NCEP/NCAR REANALYSIS. Mark C. Serreze, CIRES/Univ. of Colorado, Boulder, CO; and A. H. Lynch and M. P. Clark

2:45 P.M.
15.19 NATURAL AND ANTHROPOGENIC CLIMATE VARIATIONS IN THE ARCTIC. John W. Weatherly, U.S. Army Cold Regions Research and Engineering Lab, Hanover, NH; and C. Bitz

3:00 P.M. CONFERENCE ENDS
5:00–6:00 P.M. CLOSING RECEPTION IN EXHIBIT HALL (Cash Bar)

6:30 P.M. CLOSING KEYNOTE ADDRESS
Speaker: Jean-Michel Cousteau, President and Founder, Ocean Futures Society, Santa Barbara, CA

7:30–9:30 P.M. FIESTA

The pronounced increase of surface temperature in Antarctic Peninsula region is one of the indicators of currently observed global warming. Linear trend of mean annual temperature at Russian Antarctic station Bellinsghausen demonstrates the warming of about 1 C during 31-year period. This station is situated on the Fildes Peninsula in the South-Western part of King-George Island. For quantitative estimating of present climate changes the data of 3- and 6-hourly meteorological measurements obtained at Bellinsghausen for period from March 1968 to January 2001 were considered and processed. The statistical analysis of temperature, pressure, cloudness and precipitation fields was executed for estimation of input of atmospheric processes with different time scales (from synoptic disturbances to interannual oscillations) into climate changes. The significant influence of the synoptic disturbances on regional climatic parameter trends is demonstrated. The traditional methods of regressive and correlative analyses as well as methods of stochastic analysis of the ensemble of several periodically correlated random processes are used for interannual oscillation description and low-frequency trend determination. Results were compared with estimates of trends for other stations (Orcadas, Esperanza, Faraday/Vernadsky, Marambio, King Senjong) located in different parts of Antarctic Peninsula with different climatic conditions. Extremes values analysis results of the surface meteorological parameters, characteristics of boundary layer and of upper atmosphere are presented. Several synoptic situations, caused the forming of absolute temperature maximums at Bellinsghausen station are discussed. Obtained results are compared with NCAR/NCEP Reanalysis (1958-1998) data set and with hemispheric temperature anomaly time series. Statistical features of climatic parameters variation in Western and Eastern parts of Southern Hemisphere are demonstrated on the base of Mirny Observatory data set. Mirny is situated on the coast of Cape Davis at a small protrusion of Mirny Peninsula. Possible causes of determined climatic tendencies are discussed in connection with available data about cloud cover regime, eddies synoptic activity and sea ice dynamics. For further and reliable quantitative monitoring of Antarctic Peninsula warming it is necessary to carry out the international comparison of available meteorological parameters time series.

S023-S1 06 1030

ARCTIC AND ANTARCTIC OSCILLATIONS IN A 20-MEMBER ENSEMBLE SIMULATION
Matsumura Shinji (presenting), Xie Shang-Ping , Numaguti Atusi , Yamazaki Koji

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A 20-member ensemble simulation has been conducted with the CCSR/NIES atmospheric GCM (AGCM) to investigate the time-space characteristics of the Arctic and Antarctic Oscillations (AO and AAO, respectively). Each of the 20 AGCM integrations is forced by the identical global SST and sea ice history observed for 1959-1998, and differs only in the initial conditions. Our analysis focuses on the boreal winter season. AO and AAO appear as the first EOF modes of the ensemble-mean variability and resemble very much their observed counterparts. In the Northern Hemisphere, the ensemble mean reproduces reasonably well the quasi-decadal oscillation that was particularly pronounced in the AO time series for the recent three decades. In the Southern Hemisphere, the ensemble-mean AAO time series is correlated with the equatorial Pacific ENSO. Recent empirical studies raise a question of whether the AO is a true mode of climate variability or an artifact of EOF analysis. At issue is the correlation among AO's three centers of action. Our analysis shows that variability in these three centers of action is highly correlated with each other in each of the individual member integrations, indicating that the AO is indeed a mode of atmospheric internal variability. But the correlation among these centers of action decreases significantly in the ensemble mean, suggesting that other climatic modes like the PNA forced by the equatorial Pacific ENSO interfere with AO's time evolution.

S02.3-S1 07 1045

THE NH WINTER JETS' SEESAW AND THE AO
Wang Julian X.L. (presenting)

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The northern hemisphere winter jet streams, i.e., sub-tropical jet and polar night jet, shows two dominant time scales, ENSO and decadal. The jet intensities exhibit an out-of-phase relationship with each other, a seesaw. This behavior is closely tied with the AO variations and SST changes. The energy flux associated with the jets' seesaw indicate a partition or distribution of energy originated from mid-latitude troposphere being responsible to such a phenomenon.

S023-1 09 1130

IMPACT OF LARGE-SCALE MODES OF ATMOSPHERIC VARIABILITY ON ARCTIC BASIN MOISTURE FLUX
Bromwich David H. (presenting), Wang Sheng-Hung , Cassano Elizabeth N.

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Spatial and temporal variability of Arctic Basin precipitation is examined using NCEP/NCAR Reanalysis data for the years 1949-1999. P-E calculated from moisture balance equation is compared with the North Atlantic Oscillation (NAO) and the Arctic Oscillation (AO). On an annual basis, Arctic Basin P-E is much more closely correlated with the NAO (0.69) than with the AO (0.49), consistent with the Atlantic Ocean domination of the northward moisture across 70 N. The impact of these large scale oscillations is found to be more significant during the winter, with a correlation of 0.49 for NAO and 0.56 for the AO. Regional analysis confirms that the NAO impact on P-E is concentrated around the periphery of the North Atlantic Ocean and extends north into the Arctic Ocean during winter. The NAO and AO differ in their P-E modulation over the northern Eurasia sector with the AO being much more important for all seasons except summer (winter AO/P-E correlation 0.53, NAO/P-E correlation 0.16), consistent with its much stronger impact on the atmospheric circulation in that area. Principal component analysis (PCA) of the annual moisture flux convergence shows a prominent center of action over the Arctic Basin extending from Greenland across the North Pole to Siberia. A spectral analysis performed on the score of the first PCA shows a periodicity of approximately 6.7 years, significant at greater than the 90 % confidence level. The circulation patterns based on the scores of the largest five positive years and the largest five negative years are compared to show the difference between the opposite phases of the first PCA pattern. Anticyclonic moisture circulation is much more prominent over the Beaufort Sea for the negative phases than the positive phases. During positive phase years, there is much more poleward moisture transport through the northern North Atlantic Ocean into the Arctic Basin.

S023-S1 10 1145

NUMERICAL SIMULATION OF THE ARCTIC OSCILLATION USING A SIMPLE BAROTROPIC MODEL WITH A PARAMETERIZED BAROCLINC INSTABILITY
Tanaka H.L. (presenting)

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The Arctic Oscillation (AO) is one of the teleconnections characterized by a seesaw pattern of air mass between the Arctic and the surrounding mid-latitude ring. Although the AO attracts more attentions in recent years, the dynamical mechanism is still an open question. In this study, numerical experiments of the AO are conducted using a simple barotropic spectral model named 'S-Model' in which the external forcing of the model is parameterized statistically based on the long-term observational data. We then conducted empirical orthogonal function (EOF) analysis for the expansion coefficients (w_i) of the model atmosphere, searching for the AO mode. In order to compare the model result with the observed atmosphere, we first analyzed the same barotropic expansion coefficients (w_i) for the NCEP/NCAR reanalysis for 21 years. The result of the leading EOF component for the observed atmosphere shows an annular mode resembling the AO pattern, suggesting that the the AO is essentially a barotropic mode. As a result of the numerical simulations with the S-Model, the realistic AO pattern is obtained only when the external forcing is parameterized with w_i and w_i*, i.e., the complex conjugete of w_i. Although the annular mode is simulated without the w_i* term, the non-zonal part of AO is produced only when the w_i* term is included. Since the w_i and w_i* terms represent down-scale and up-scale energy transfers, respectively, the result suggests that the up-scale energy transfer (or interactions) from synoptic to planetary scale waves is essential to produce the non-zonal part of the AO.

S02.3-S1 11 1330

DECADAL AND INTERDECADAL ARCTIC VARIABILITY
Polyakov Igor (presenting), Johnson M. , Alekseev G. , Bekryaev R. , Bhatt U. , Colony R. , Karklin V. , Makshtas A. , YuLin A.

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Analysis of observational data and modeling results shows that the decadal-scale mode (DM) and a low-frequency oscillation (LFO) with an approximate time scale of 60-80 years, dominate atmospheric and oceanic variability in the Arctic. Both modes were positive in the 1990s, signifying a prolonged phase of anomalously low atmospheric sea level pressure and above normal surface air temperature in the central Arctic. Consistent with an enhanced cyclonic component, the arctic anticyclone was weakened and vorticity of winds became positive. The rapid reduction of arctic ice thickness in the 1990s may be one manifestation of the intense atmosphere and ice cyclonic circulation regime due to the synchronous actions of the DM and LFO. Our results suggest that the decadal DM and multidecadal LFO drive large amplitude natural variability in the Arctic making detection of possible long-term trends induced by greenhouse gas warming most difficult.

S02.3-S1 12 1345

OBSERVED MODES OF THE ARCTIC CLIMATE WARMING IN 1930s AND 1990s
Alekseev Genrikh V. (presenting), Zakharov V.F. , Korablev A.A. , Kharlanenkova N.E.

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The idea about the increased atmospheric circulation and heat transfers to the Arctic as the primary cause of Arctic climate warming in the 1920s -1930s was developed in the past many scientists. The development of present Arctic warming is also related to the changes in the atmospheric circulation especially in the North Atlantic region of the Northern Hemisphere. For our investigation were selected a time series of monthly mean surface air temperature at the Arctic meteorological stations with the start of observations not later than 1921, a set of monthly mean surface air temperature at grid (5o j x 10o l) points from 20o to 85o N for 1891-1999, sets of, water temperature and salinity in different parts of the Arctic Ocean and Nordic Seas for 1894-2000. Statistical analysis of this data was performed and modes of both of Arctic climate warming are considered with emphasis on the role of the atmospheric circulation in their development. A comparison of the average temperatures during the period of Arctic warming in 1930s and in 1990s indicated that the first period was warmer during from August to January and the second - from March to June. The first warming is greater than the second in the North Atlantic sector of the Arctic for both periods of the year. The changes in the Arctic sea ice extent from 1900 are characterized in general by gradual decrease with two accelerations in 1920-1940 and 1980-1998 between whichice extent was increased. A comparative analysis of the water mass changes in the Arctic Ocean and the Nordic Seas revealed that warming of the Atlantic water layer recorded in the 1991-2000 observations in different parts of the Arctic Basin was the most noticeable climatic signal over the last two decades. The changes in the characteristics of water masses during the first warming period were the highest Atlantic water salinity in the Norwegian and the Greenland Seas over the entire observation period and increased temperature that was also recorded in the sub-Atlantic part of the Arctic Basin. The role of atmospheric circulation is most obvious for the interannual air temperature variations in the winter season but it changes significantly through period of observation.

S02.3-S1 13 1400

INTERANNUAL VARIABILITY OF ARCTIC OCEAN TEMPERATURE AND SALINITY
Pokrovsky Oleg M. (presenting), Timokhov L.A.

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Lack and unevenly location of oceanographic observing sites at Arctic Ocean was a principal cause of absence of related variability studies. Spectral analysis was developed to overcome this problem. The basic idea of spectral analysis is to represent a ll available observational information in compressed form to minimise losses in accuracy. A well known spectral method is principal component analysis (PCA)(Hotteling method)expressed in terms of two-dimensional empirical orthogonal functions (EOF's). The combined spatial and temporal interrelationship of observational data can be expressed as a bi-orthogonal expansion closely related to SVD (singular value decomposition) of the observational matrix. The EOF's and the corresponding expansion coefficients are usually referred to as the principal components (PC) and describe the temporal modes. For each temporal mode a separate set of EOF's was calculated. Its values in missed grid points had been interpolated by kriging technique. Spectral method assumes a priori covariances of expansion coefficients to be known. The estimated a posteriori error covariances of expansion coefficients and the estimated a posteriori error covariances at the grid points are determined by some non-linear relationships contained observation error covariances and a priori covariances of expansion coefficients as well as EOF's values at observational sites and grid points. Reconstructed annual mean and uncertainty fields of water temperature and salinity for 20 depth levels in Arctic Ocean for forty years (1950-89) data set are discussed. In the present application, intensive statistics were derived for the 70's decade, which provided good temporal and spatial sampling. Statistics obtained from the spectral analysis procedure