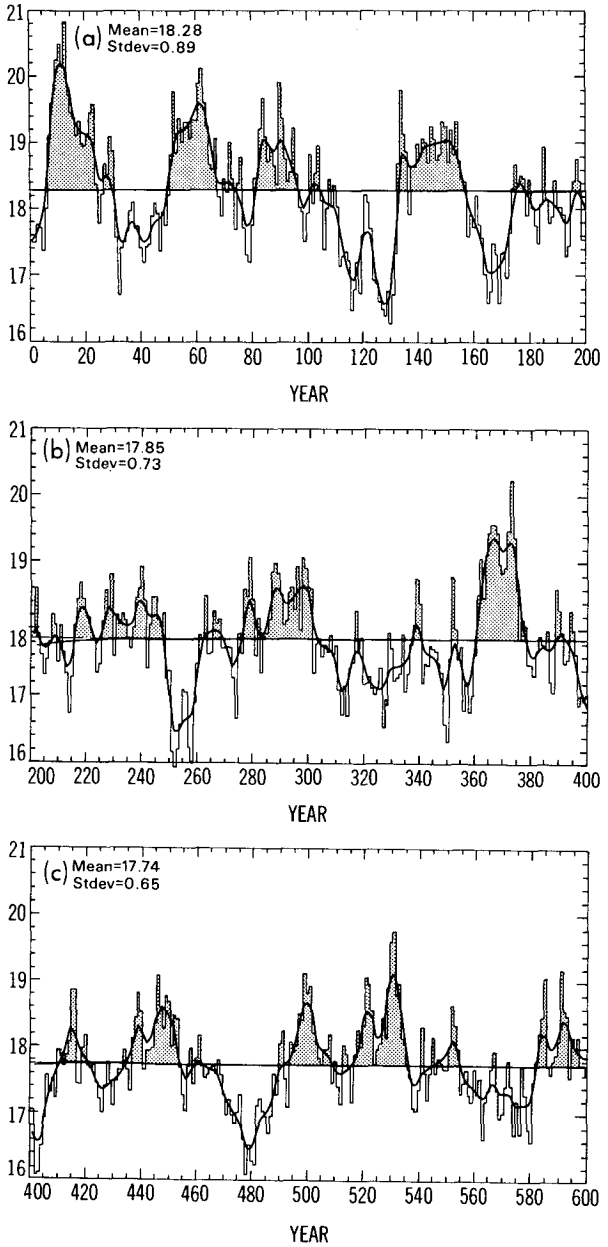

FIG. 4. Time series of the annual-mean intensity of the index of the meridional overturning in the North Atlantic. Units are Sverdrups (10^6 m^3 s^{-1}). Heavy, solid line is a smoothed time series computed by applying a 13-point binomial filter to the annual-mean data (approximately a 10-year low-pass filter). (a) Years 1–200, (b) years 201–400, (c) years 401–600.

annual-mean THC, is shown in Fig. 4. Visual inspection of this figure reveals substantial variability on interdecadal time scales, along with a quasi-oscillatory appearance to the time series. The fluctuations are present in all 600 years of the integration shown, although some of their characteristics vary with time. In particular, the time scale of the fluctuation appears somewhat longer for years 200 to 600 than in years 1 to 200. Spectral analysis of the time series from the first 200 years (Fig. 5) demonstrates enhanced variance in a fairly broad band around the 50-year time scale, while spectral analysis of years 200 to 600 (not shown) shows a broad peak around 60 years. Thus, these fluctuations have a very broad time scale.

c. Sea surface temperature, salinity, and surface air temperature variations

The spatial pattern of the anomalies of model sea surface temperature (SST) associated with fluctuations in the intensity of the THC is shown in Fig. 6a. These differences are computed by subtracting the mean of four decades with anomalously small values of the THC index from the mean of four decades with anomalously large values of the THC. The pattern of SST change bears encouraging resemblance to a pattern of observed interdecadal SST variation computed by Kushnir (1993), and shown in Fig. 6b [the observed SST pattern was computed as the difference between a period of anomalously warm SSTs in the North Atlantic (1950–1964) and a period with anomalously cold SSTs in the North Atlantic (1970–1984)]. The pattern of model sea surface salinity (SSS) changes (Fig. 6c) associated with fluctuations in the intensity of the THC resembles

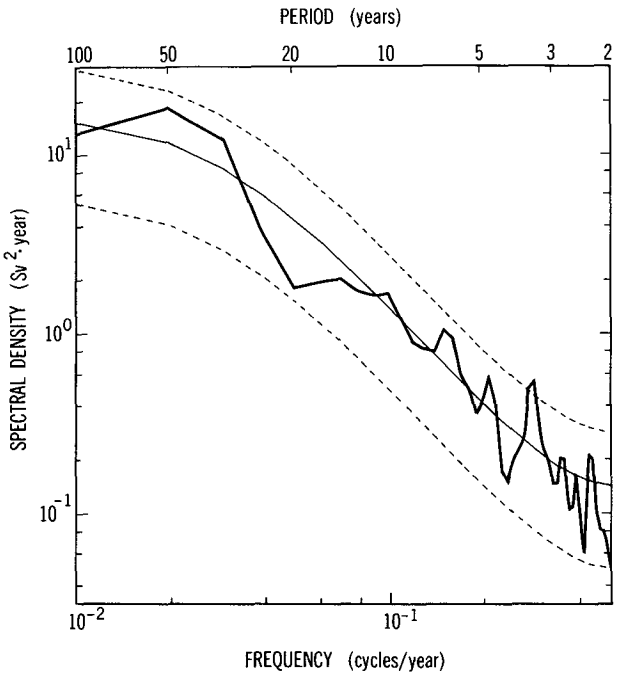

FIG. 5. Heavy, solid line denotes spectrum of the first 200 years of the thermohaline circulation index time series shown in Fig. 4. Thin, solid line denotes the least-squares best fit of a theoretical red noise spectrum to the spectrum of the thermohaline circulation. Dashed lines denote 95% confidence limits about the red noise spectrum. Note: the spectrum was computed by taking the Fourier transform of the autocovariance function, using a maximum of 50 lags and a Tukey window (Chatfield 1989, chapter 7).