

핵 파쇄 잔류물질의 지표면도달량 측정결과를 이용한 기후와 대기구조의 불안정변화에 미치는 영향

Further evidence of changing stability of atmosphere and climate on spallation product measurement

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대기권내의 적외선반응 기체들의 농도증가에 따라 여러 가지의 기후에 미치는 변수들의 변화뿐만 아니라, 대기권의 역학조건의 변화까지 체험되어지고 있다. 대기권의 역학은 30년으로 정의된 기후변화의 주기보다 훨씬 짧은 주기를 지니고 있다. 이들 변화들은 수십년 이상의 시간동안에 지표면에 도달한 일련의 핵파쇄(spallation) 잔류물질들의 농도측정결과들을 바탕으로 논의되어진다.

In a recent paper (Hartwig, ms.) I have shown that it is possible to understand and discuss the changing *Austausch* (i.e., exchange of air parcels between different atmospheric layers) between the stratosphere and troposphere by means of long-term measurement on series of spallation products. It is well known (Friend 1961; Muet *et al.* 1966, Hartwig *et al.* 1969) that there is a seasonal pattern in the ^7Be concentration of ground-level air with a maximum during May-June. This maximum is caused by enhanced exchange processes between the atmospheric compartments of the stratosphere and troposphere during this interval. Generally, those exchange processes are a consequence of stability and dynamics of the atmospheric compartments, which themselves result from, among other factors, the distribution of the heat sources in those compartments, namely the ground and the ozone layer.

Because of the growing importance of anthropogenic infrared-active gases in the atmosphere, it is to be expected that the relative importance of those original, naturally occurring heat sources will be of lesser significance, thus altering the *Austausch*. And indeed, it has been shown (Hartwig, ms.) by considering the ratio of the annual maximum and minimum during a 28-yr period of ^7Be ground-level concentration at Braunschweig, Germany (10°33'E, 52°17'N) (Kolb 1992; Wershofen 1993), that there is a steady decline in that ratio, thus indicating alteration of

atmospheric *Austausch* within the last three decades. This is commensurable with a growing concentration of infrared-active gases and the subsequent change of heat-source pattern in the atmosphere. To recognize such decline, however, it is necessary to utilize data sequences covering many years to detect the signal against the noise level.

In addition to the previously mentioned paper (Hartwig, ms.), I have discussed the maximum/minimum ^7Be ground-level concentration of another station at Skibotn, Sweden (20°25'E, 69°20'N) (Kolb 1992), which has only a 15-yr duration, namely the time span between 1976 and 1990. Although this time span is considerably shorter than that of the Braunschweig data, there still is a distinct decline in the annual maximum/minimum ratio, showing a tendency toward decreasing *Austausch* between stratosphere and troposphere over those 15 yr. The two stations are situated in considerably different geographic locations, giving all the more significance to the agreement in tendency of atmospheric exchange pattern between stratosphere and troposphere. This agreement supports the view that anthropogenic infrared gases mitigate the relative importance of natural atmospheric heat sources and achieve a changing *Austausch*. Nevertheless, as expected, the signal discussed here is not so evident as in the case of the Braunschweig data, because the time span of the data series is shorter.

Fig. 1 shows ratio of each year between the highest and lowest monthly concentration value. The figure includes three data sets for each year, calculated from the mean of one, two or three months, respectively. In addition, the compensating line is shown along with the corresponding equation. It can be clearly seen that with lower stratospheric influence (multiple monthly average value) the effect of changing *Austausch* is less distinct.

These data confirm the observation that the growing amount of anthropogenic infrared-active gases in the atmosphere changes not only climatic parameters but also short-term parameters such as the dynamic of the atmosphere and consequently exchange processes.

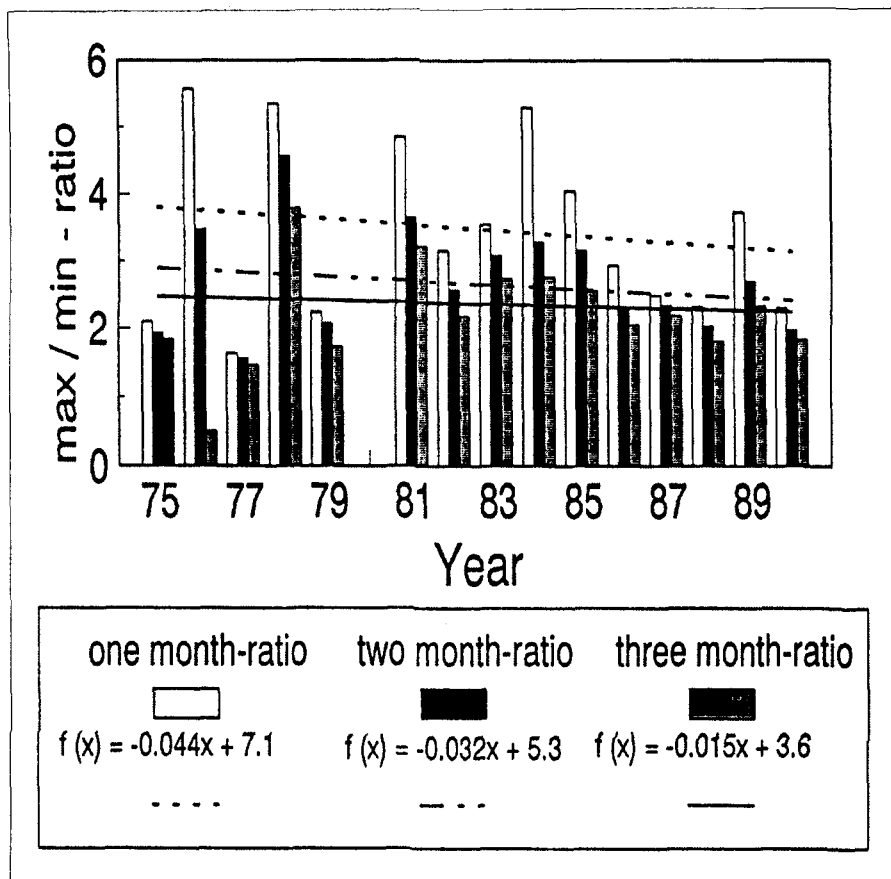


Fig. 1 Max/min ^7Be concentration ratio in ground-level air for averages of highest to lowest value of each year at the station Skibotn ($20^{\circ}5'E$, $69^{\circ}02'N$).

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