

ERA-40 Clouds for UV calculations

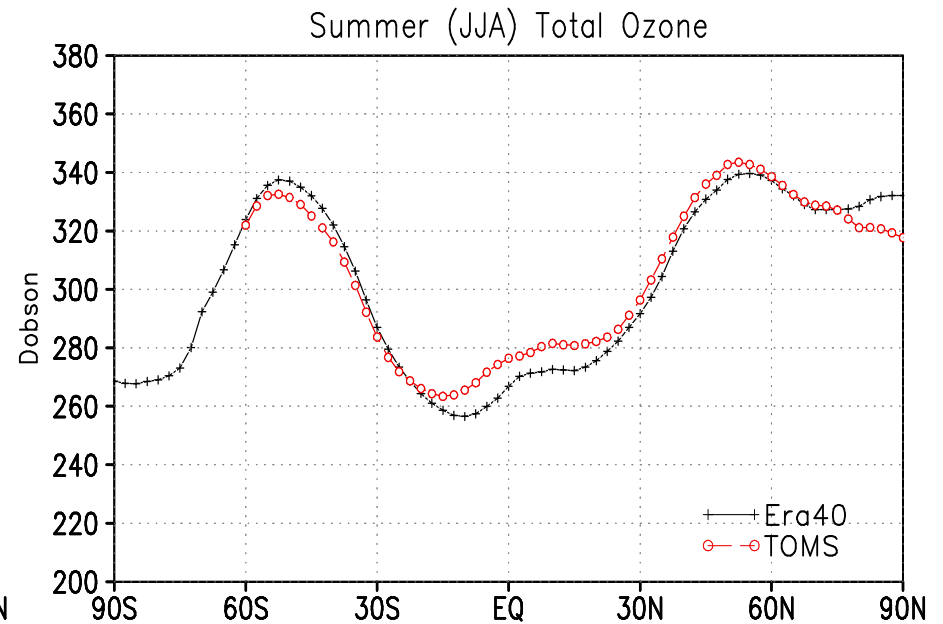
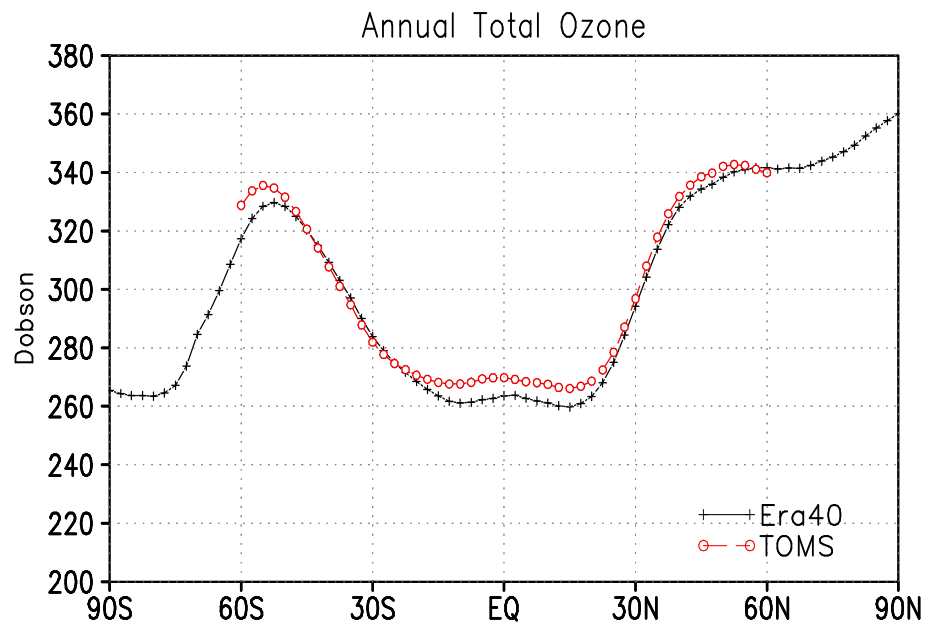
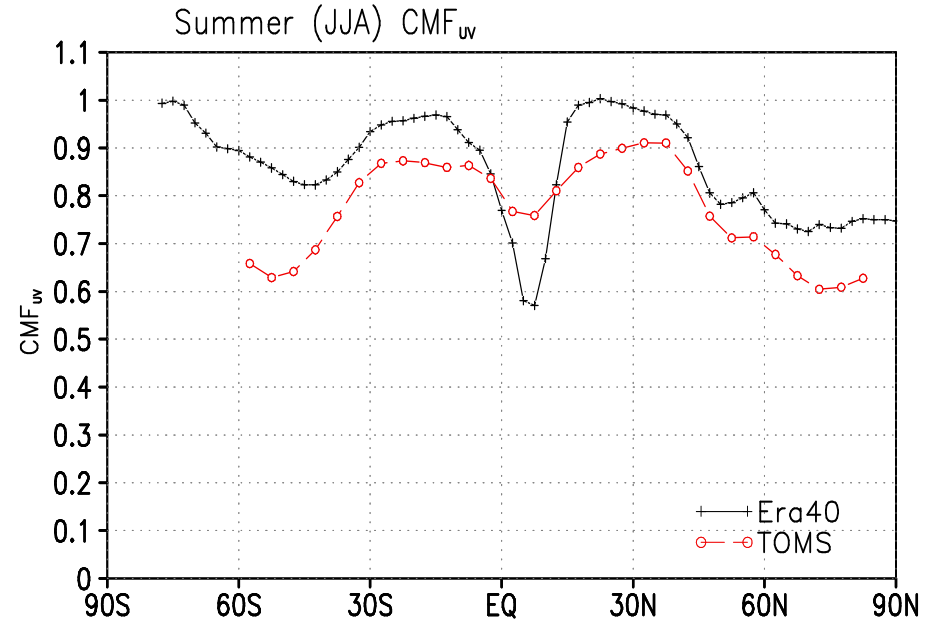
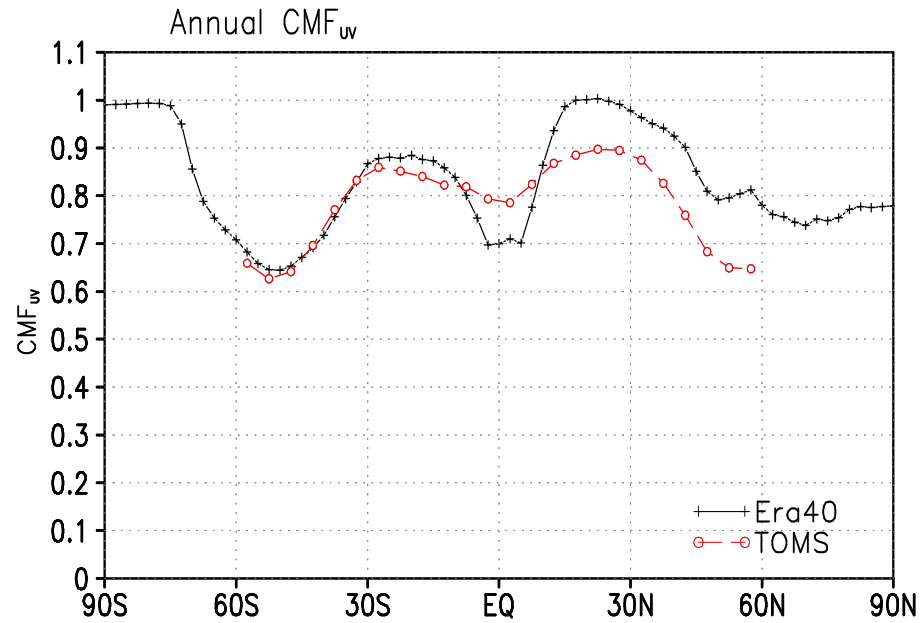
- 2.5 x 2.5 latitude/longitude grid
- 6 hour analyses
- two methods:
 - vertically integrated cloud water → cloud optical depth
 - instantaneous fields every 6 hours
 - grid box divided into clear and cloudy parts using total cloud cover
 - non-linearities cause problems
 - solar radiation diagnostics:
 - surface net solar radiation (SSR)
 - surface net solar radiation, clear sky (SSRC)
 - integrated sum over 6 hour forecast
 - ratio of SSR/SSRC → Cloud Modification Factor for full solar radiation
 - cloud effect in UV: modelling → $f(\text{sza}, \text{SSR}/\text{SSRC}, \dots)$



OUTLINE

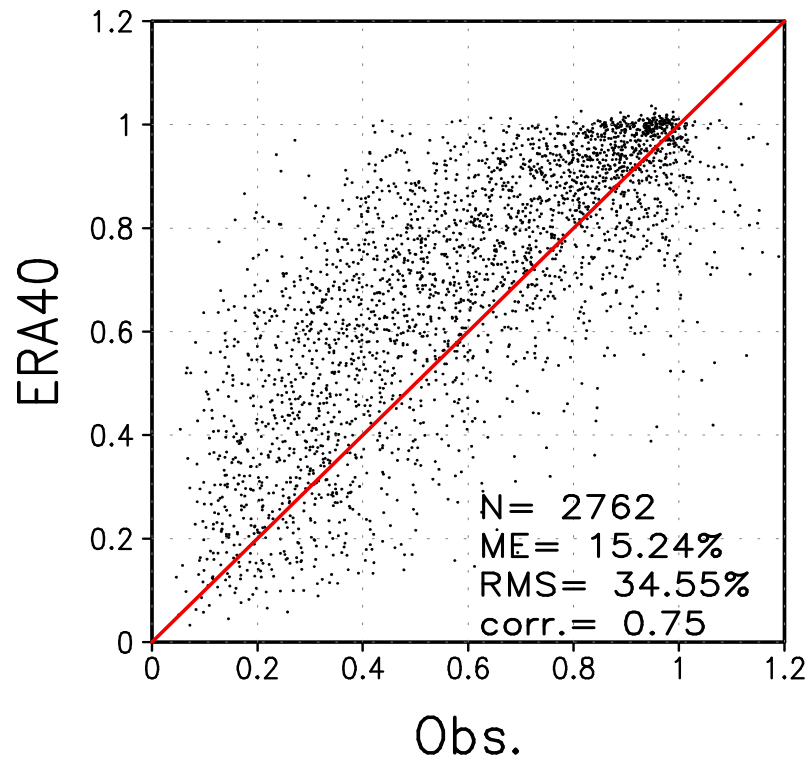
- CMF UV satellite vs. ERA-40
- CMF global radiation: ERA-40 versus obs ($= G_{\text{obs}} / G_{\text{cls_model}}$)
 - Daily sum
 - Jokioinen
 - Norrköping
 - Thessaloniki
 - Bilthoven
 - Potsdam
 - Annual sum
 - Potsdam
 - Bilthoven
- CMF error
 - As a function of CMF
 - As a function of day of year
- Conclusions

Mean over longitudes 0–30E during 1980–2000

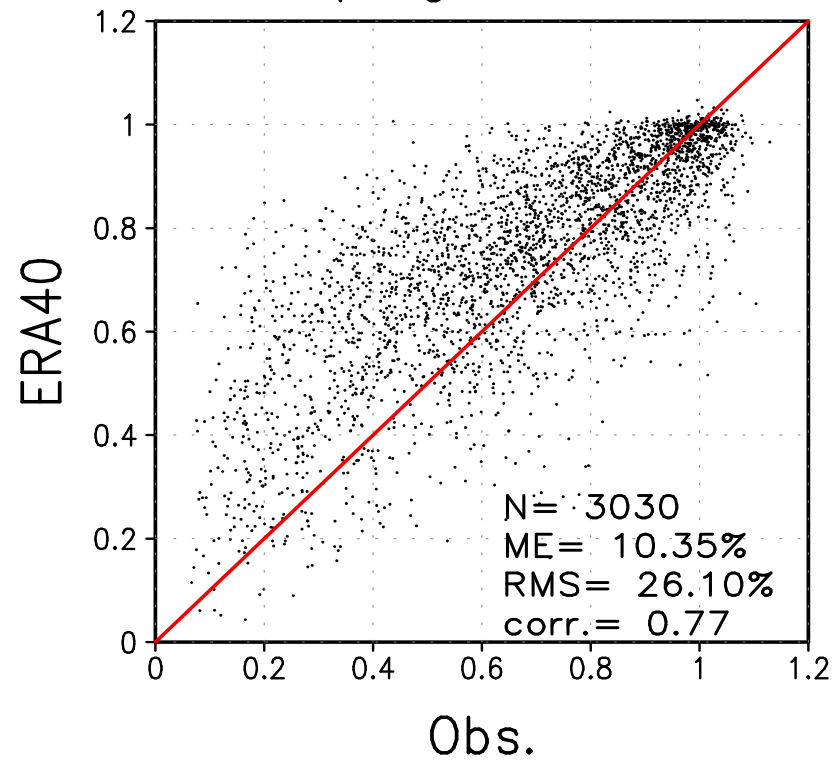


Cloud Modification Factor, full solar radiation

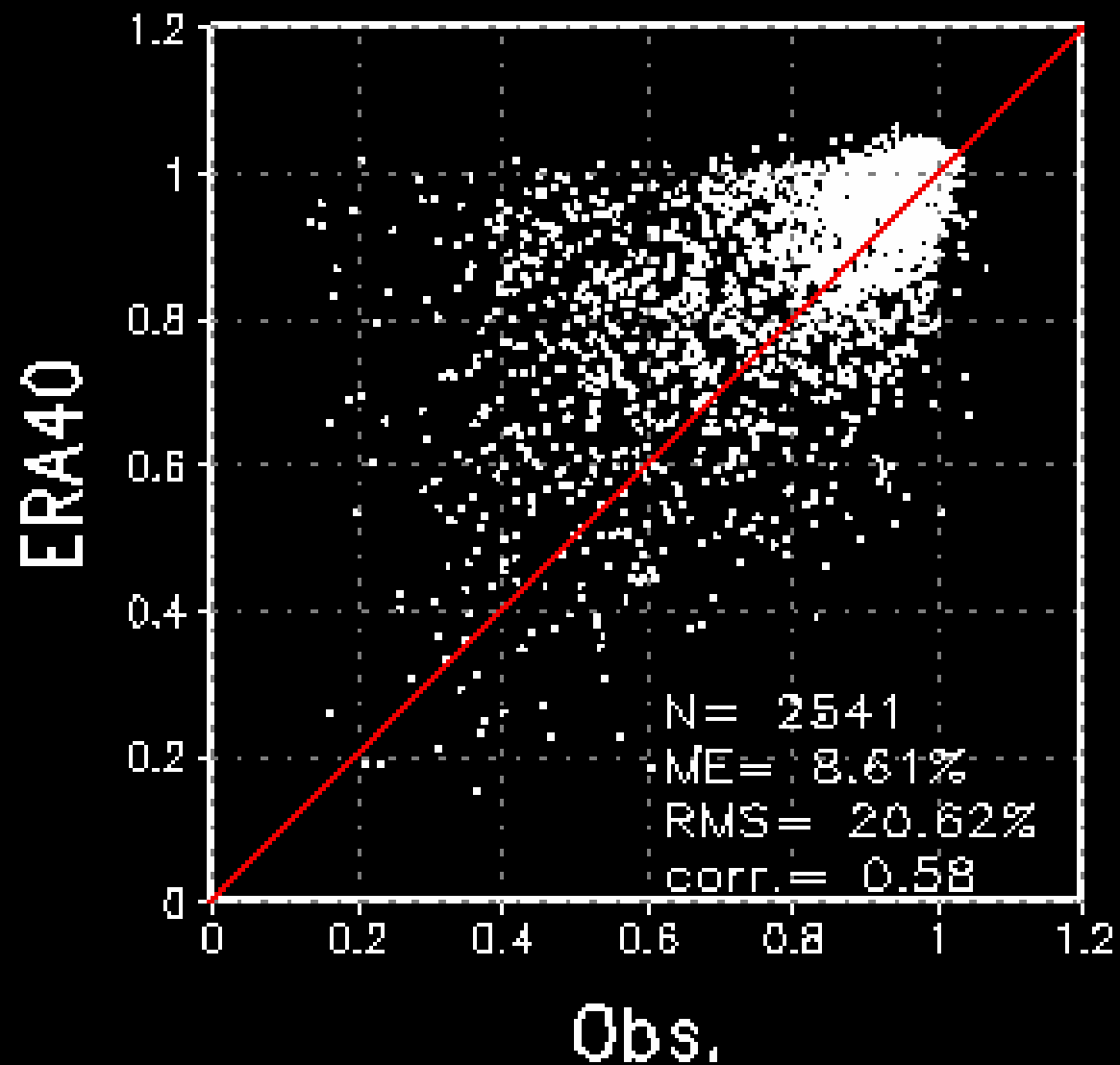
Jokioinen 1995–2002



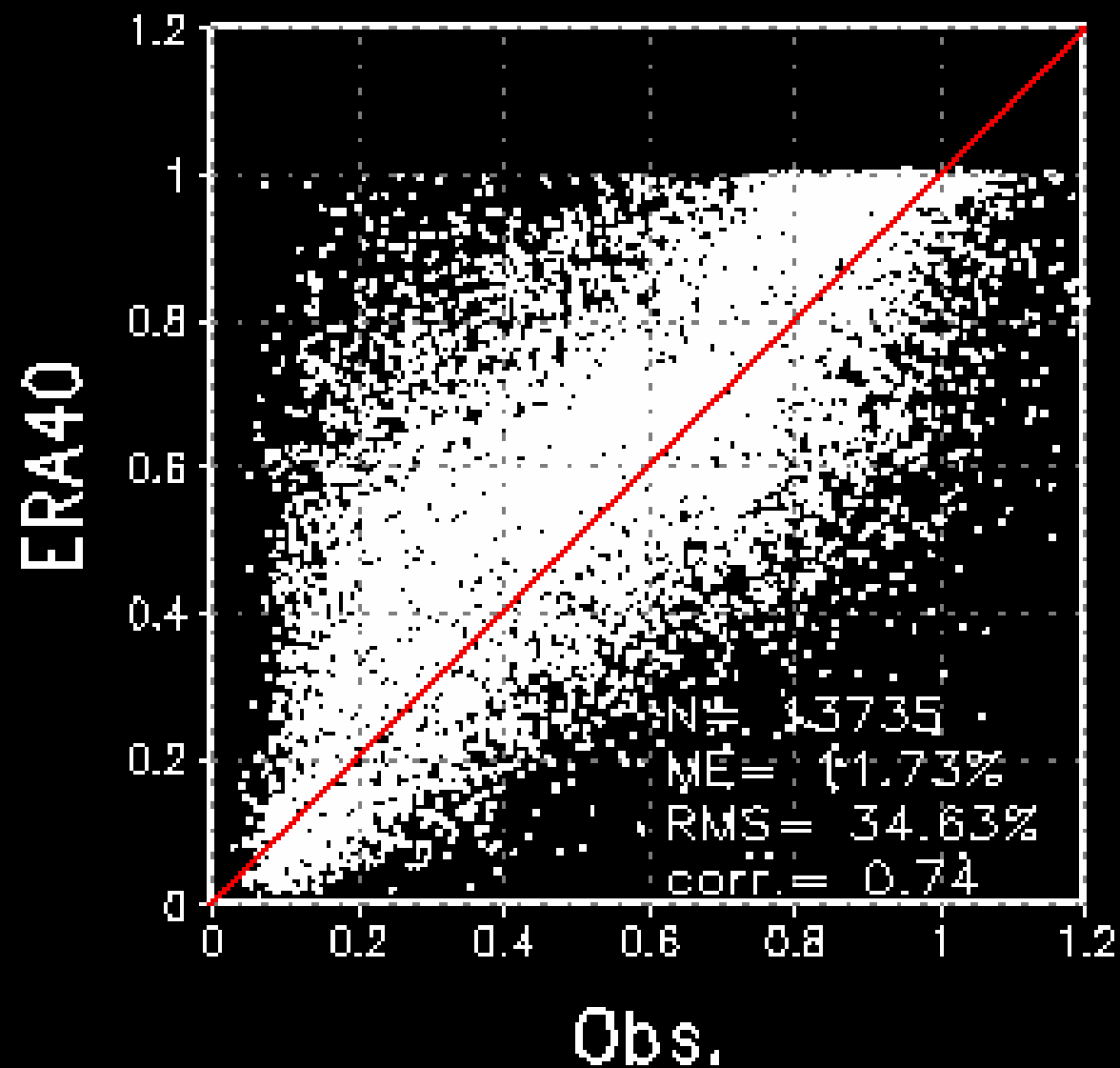
Norrkoping 1983–2002



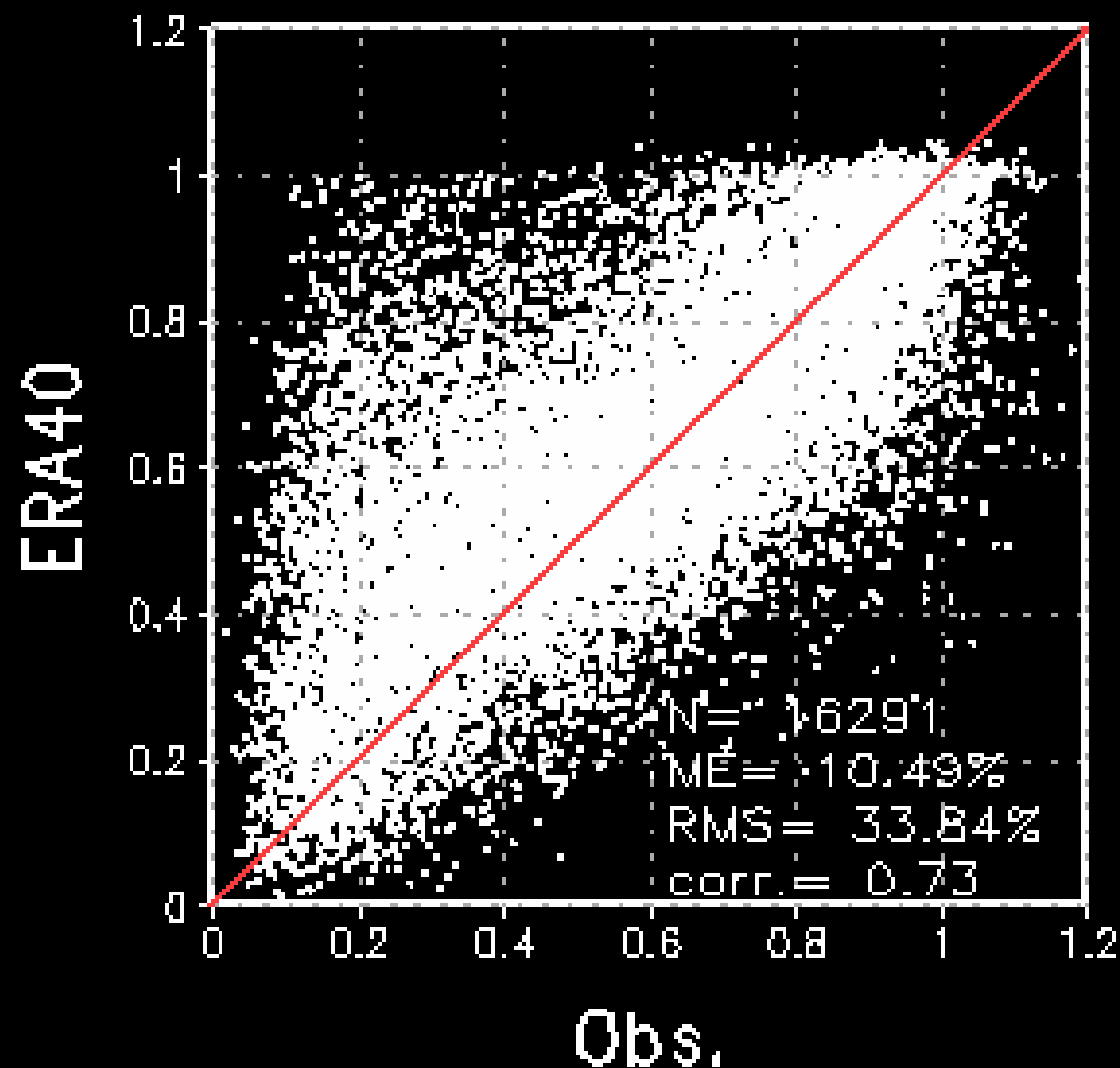
Cloud Modification Factor
full solar radiation
Thessaloniki 1992–2002



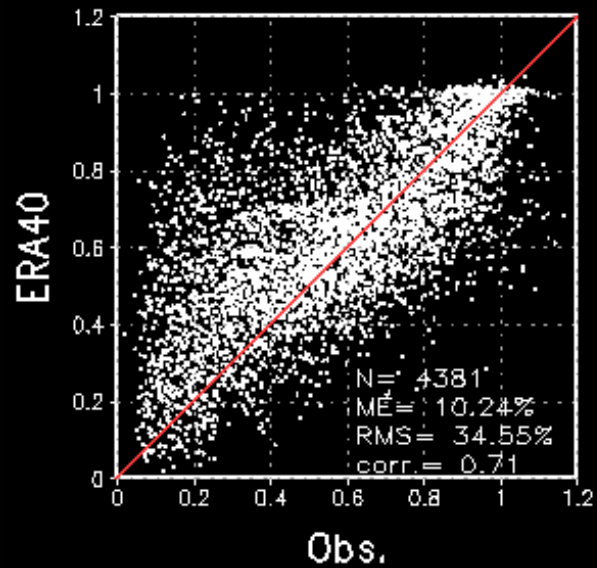
Cloud Modification Factor full solar radiation Bilthove 1965-2002



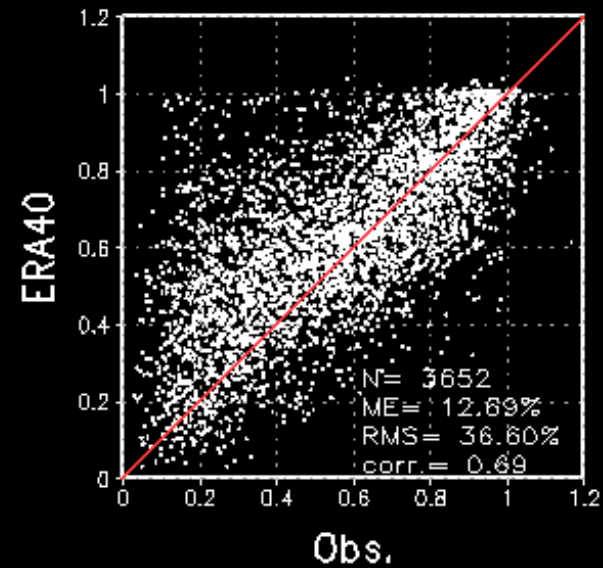
Cloud Modification Factor
full solar radiation
Potsdam 1958-2002



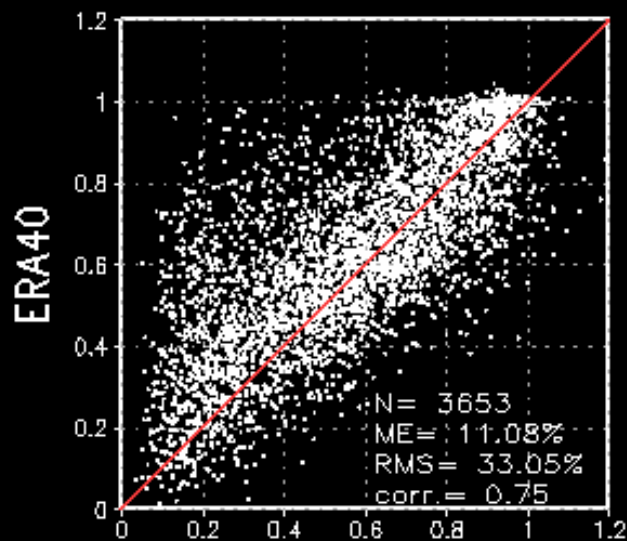
Cloud Modification Factor
full solar radiation
Potsdam 1958–1969



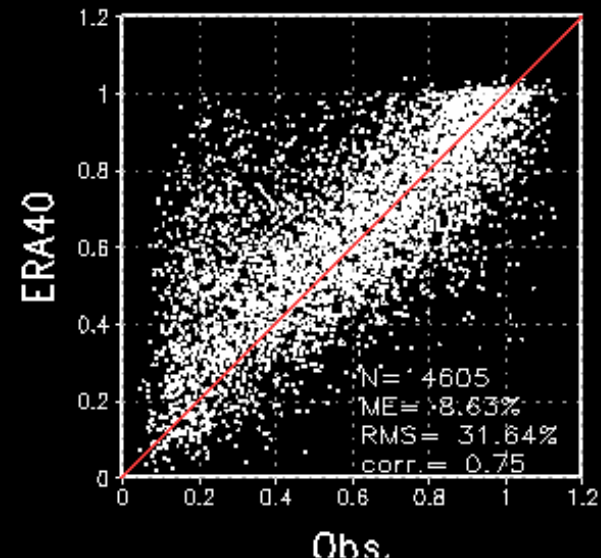
Cloud Modification Factor
full solar radiation
Potsdam 1970–1979



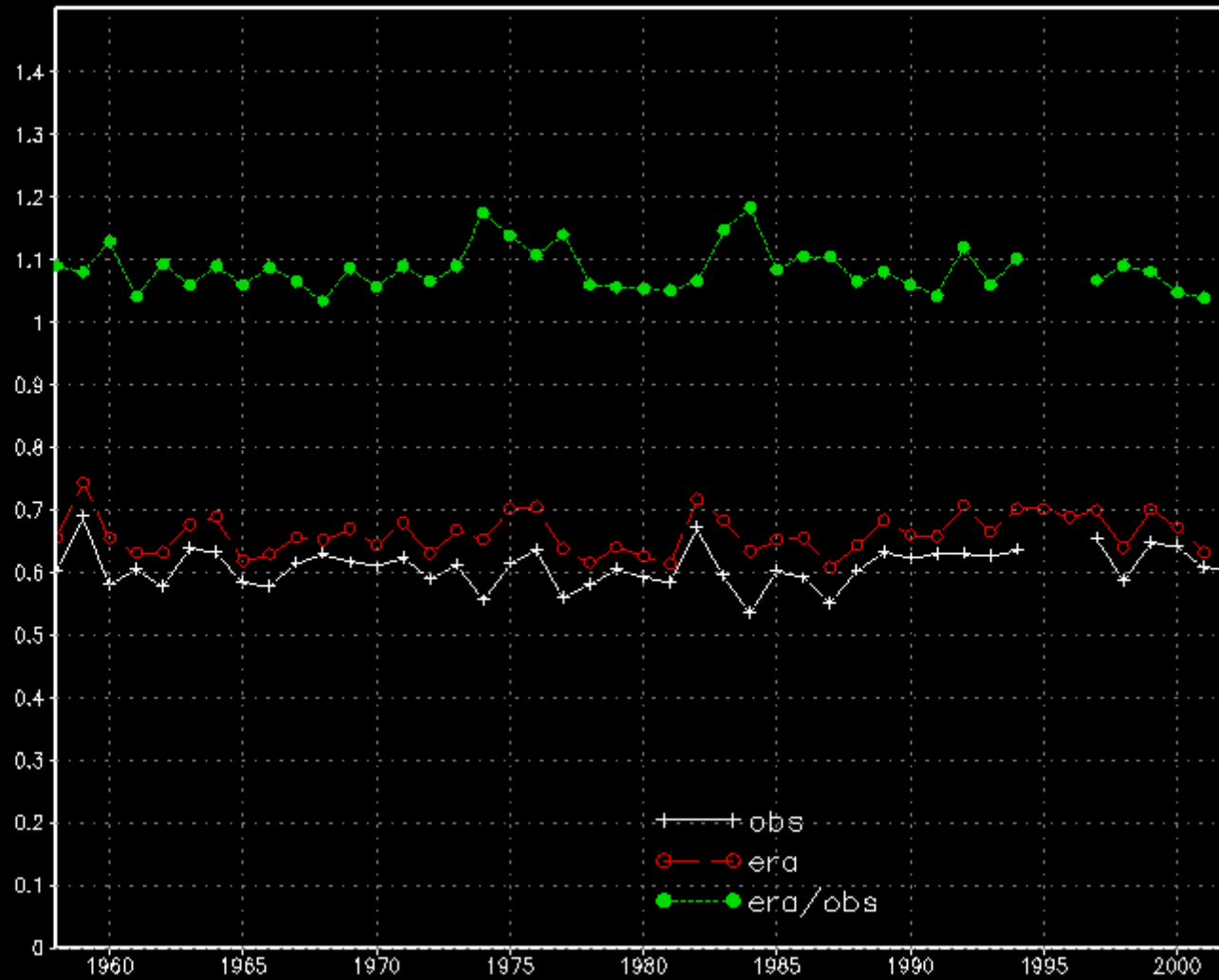
Cloud Modification Factor
full solar radiation
Potsdam 1980–1989



Cloud Modification Factor
full solar radiation
Potsdam 1990–2002



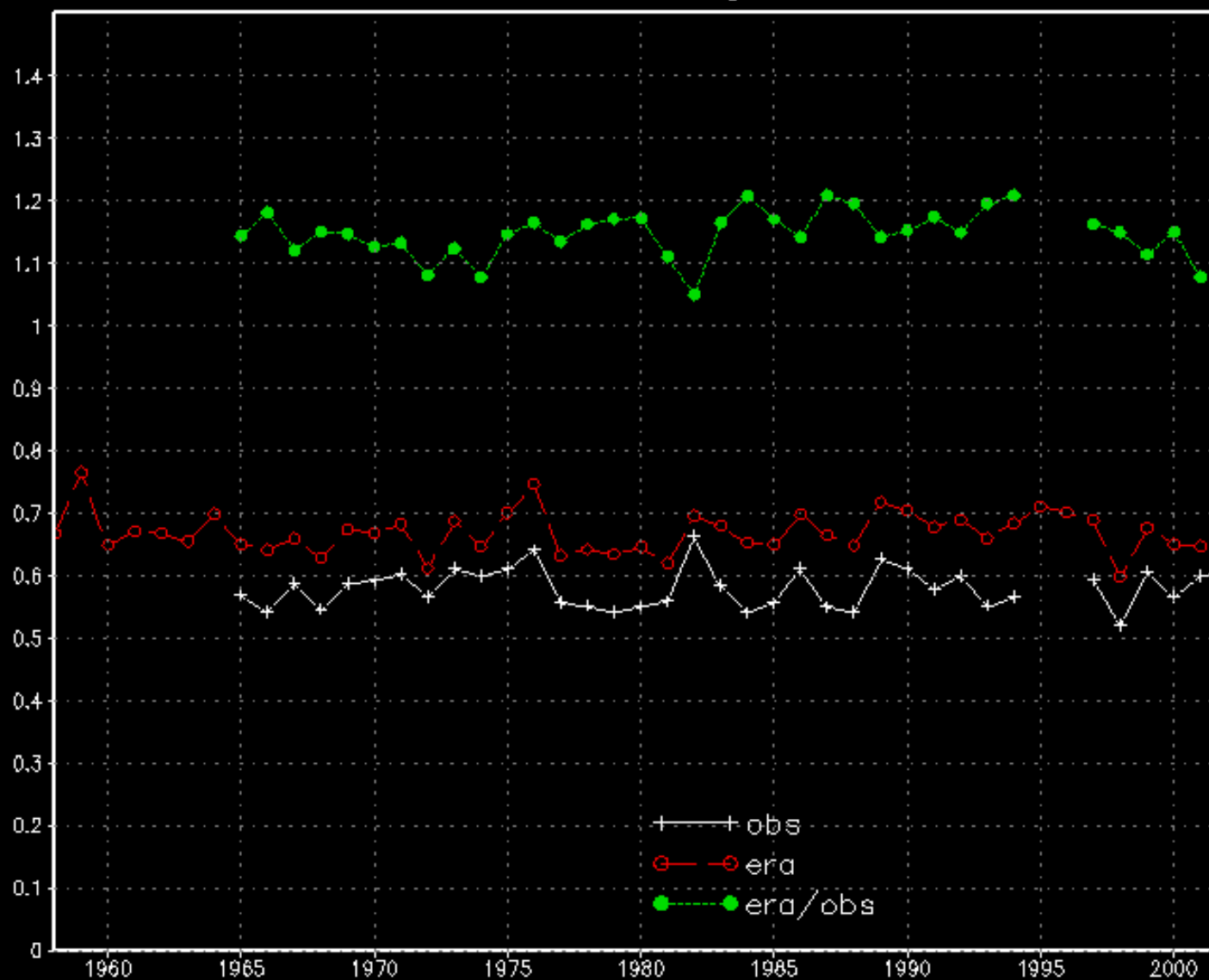
Potsdam Annual CMF global radiation



Potsdam Annual CMF global radiation



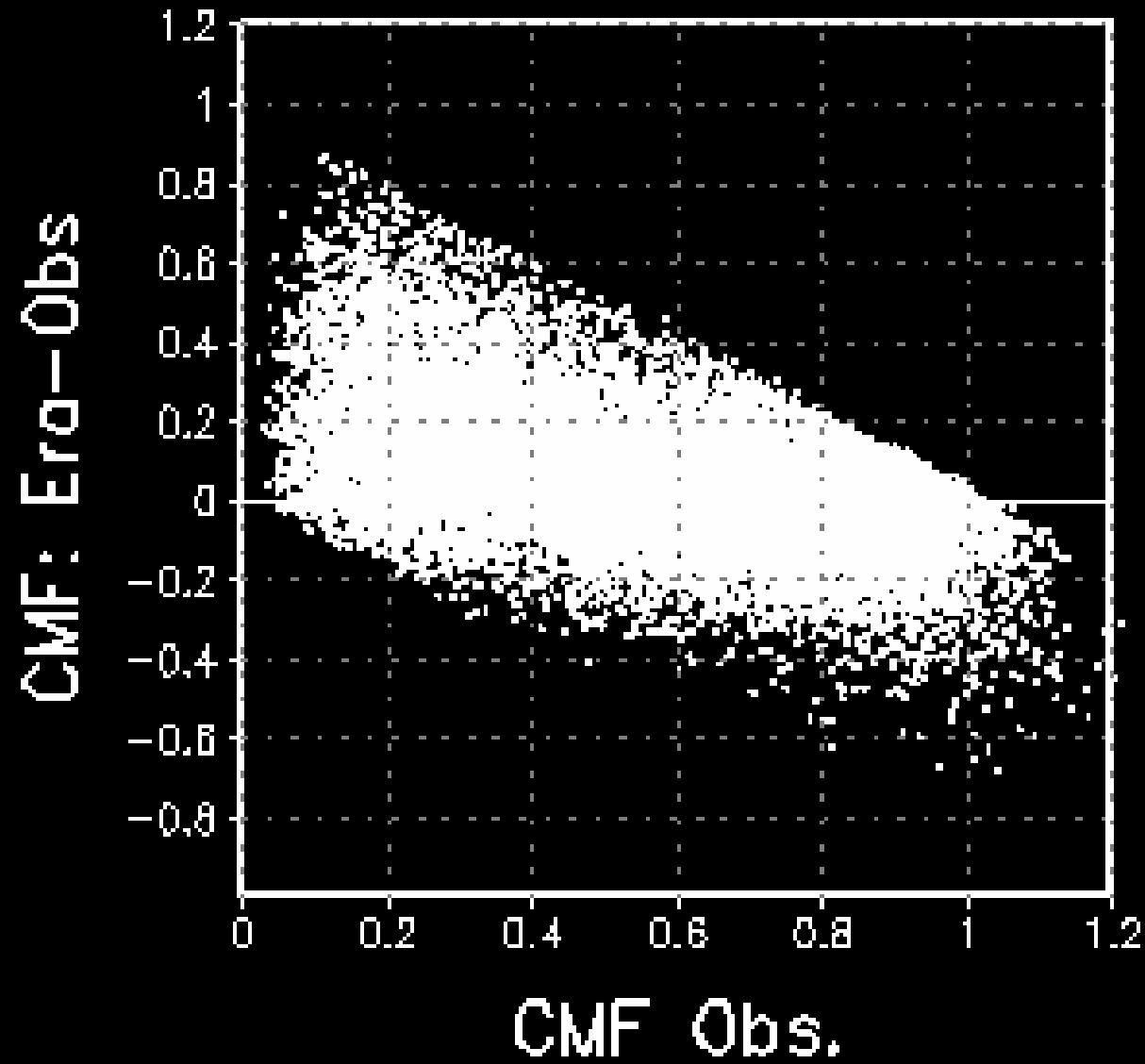
Bilthoven Annual CMF global radiation



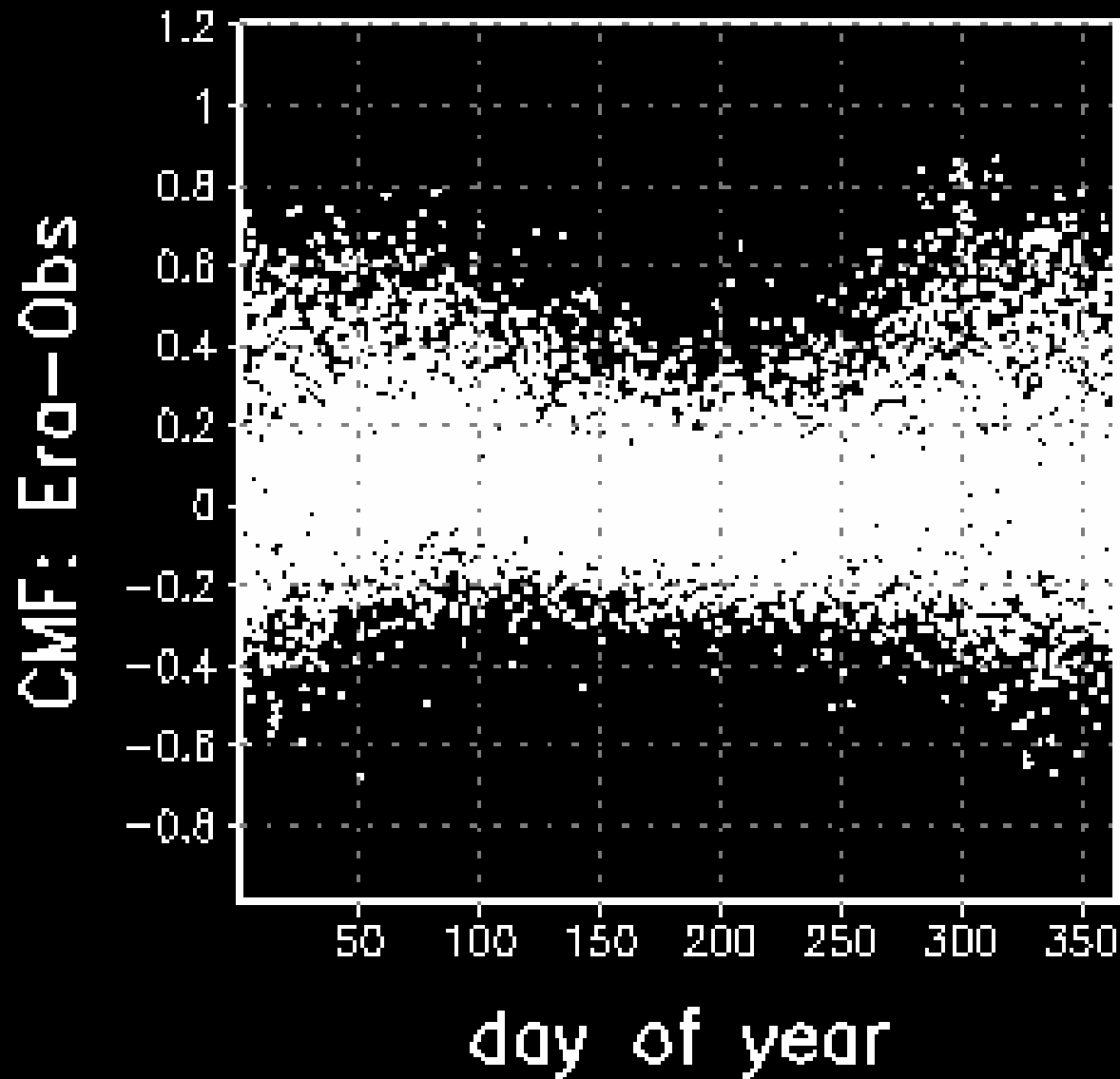
Bilthoven Annual CMF global radiation



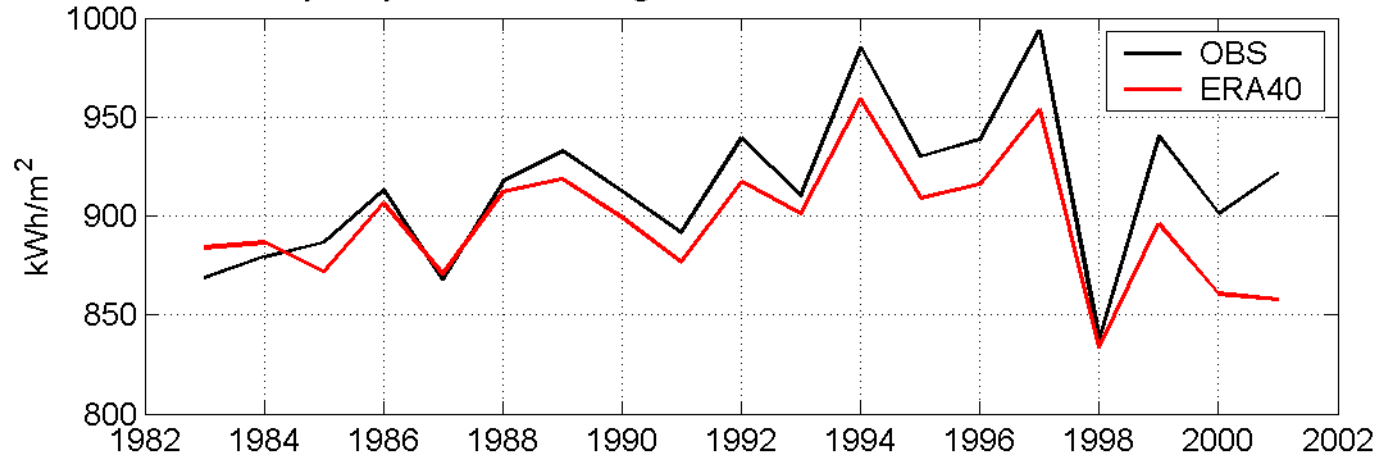
Cloud Modification Factor
full solar radiation
Potsdam 1958-2002



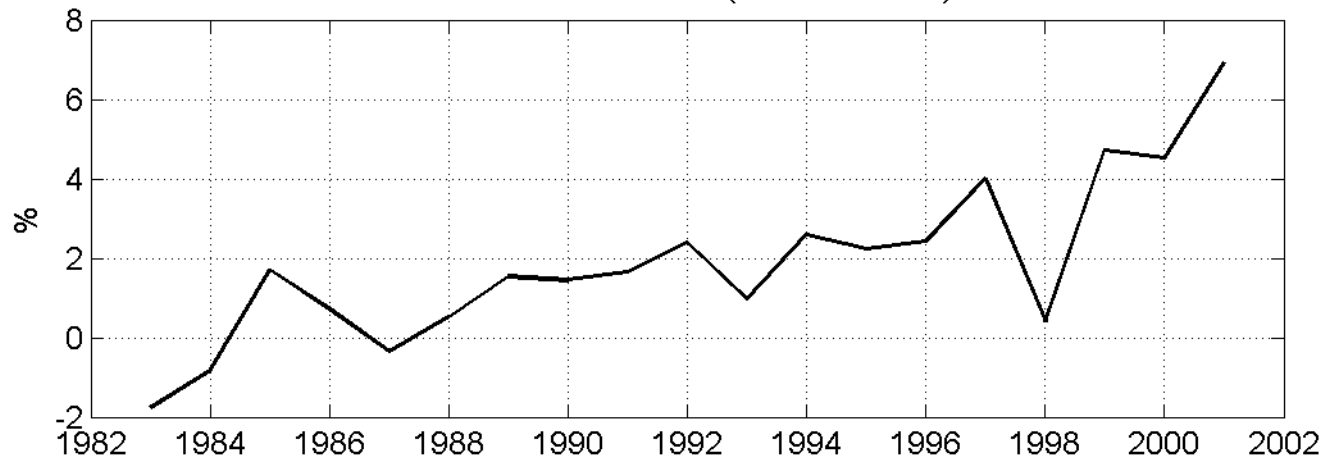
Cloud Modification Factor
full solar radiation
Potsdam 1958-2002



Mean yearly accumulated global radiation at 10 Swedish stations.



Relative difference: $100 \cdot (\text{OBS} - \text{ERA40}) / \text{OBS}$.

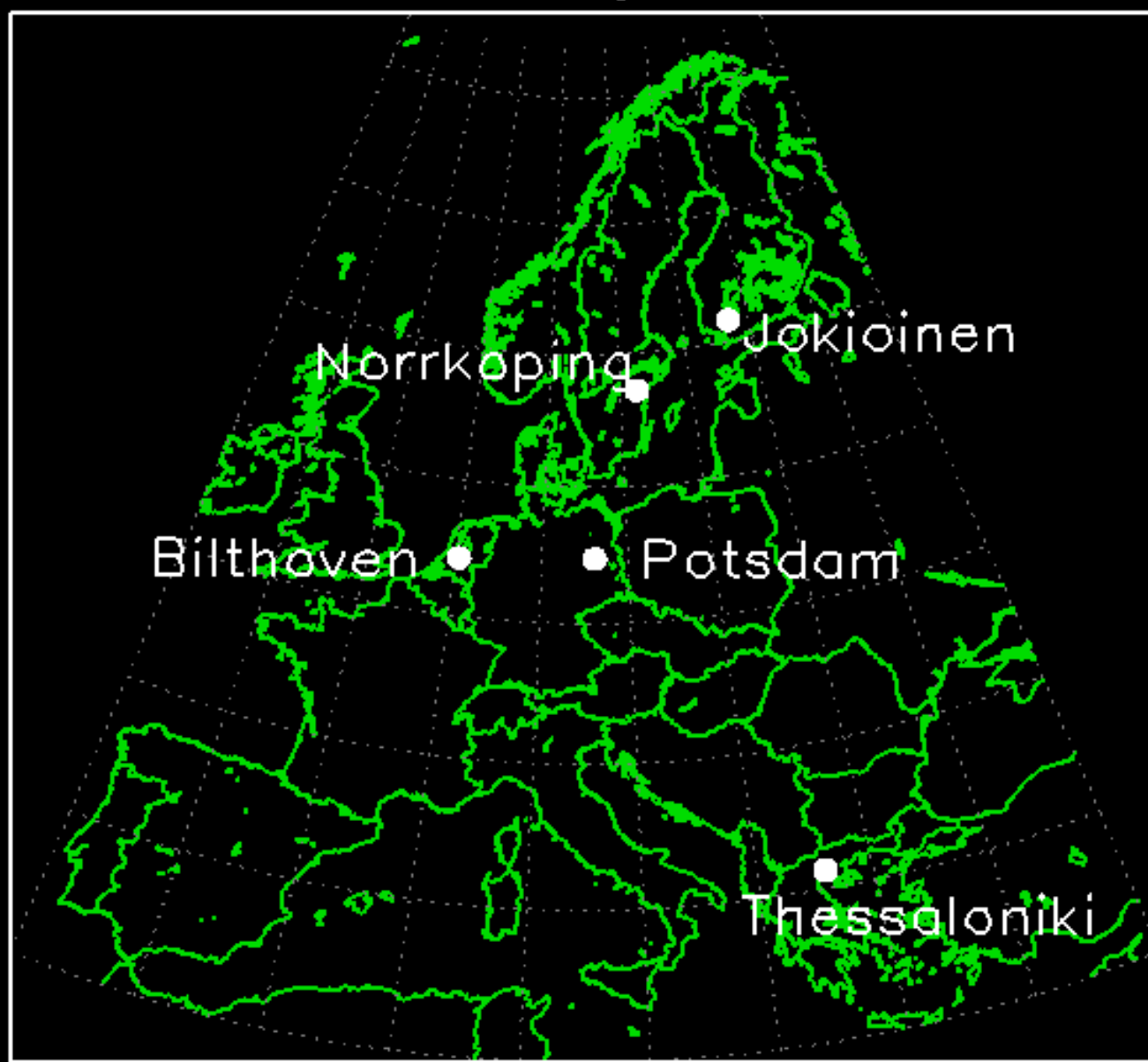


conclusions

- quality of ERA-40 clouds?
 - available cloud parameters not enough to calculate COD
 - surface radiation diagnostics have some problems
 - $\text{CMF}_{\text{solar}}$ too high in comparison with all studied European sites
 - CMF_{uv} higher than the TOMS data
 - Error in $\text{CMF}_{\text{solar}}$ depends on the cloud thickness, might be related to the difference in FOV
 - Correction of $\text{CMF}_{\text{solar}}$??
 - $\text{CMF}_{\text{uv}} = f(\text{sza}, \text{CMF}_{\text{solar}})$
 - Do we know enough about the geographical distribution?

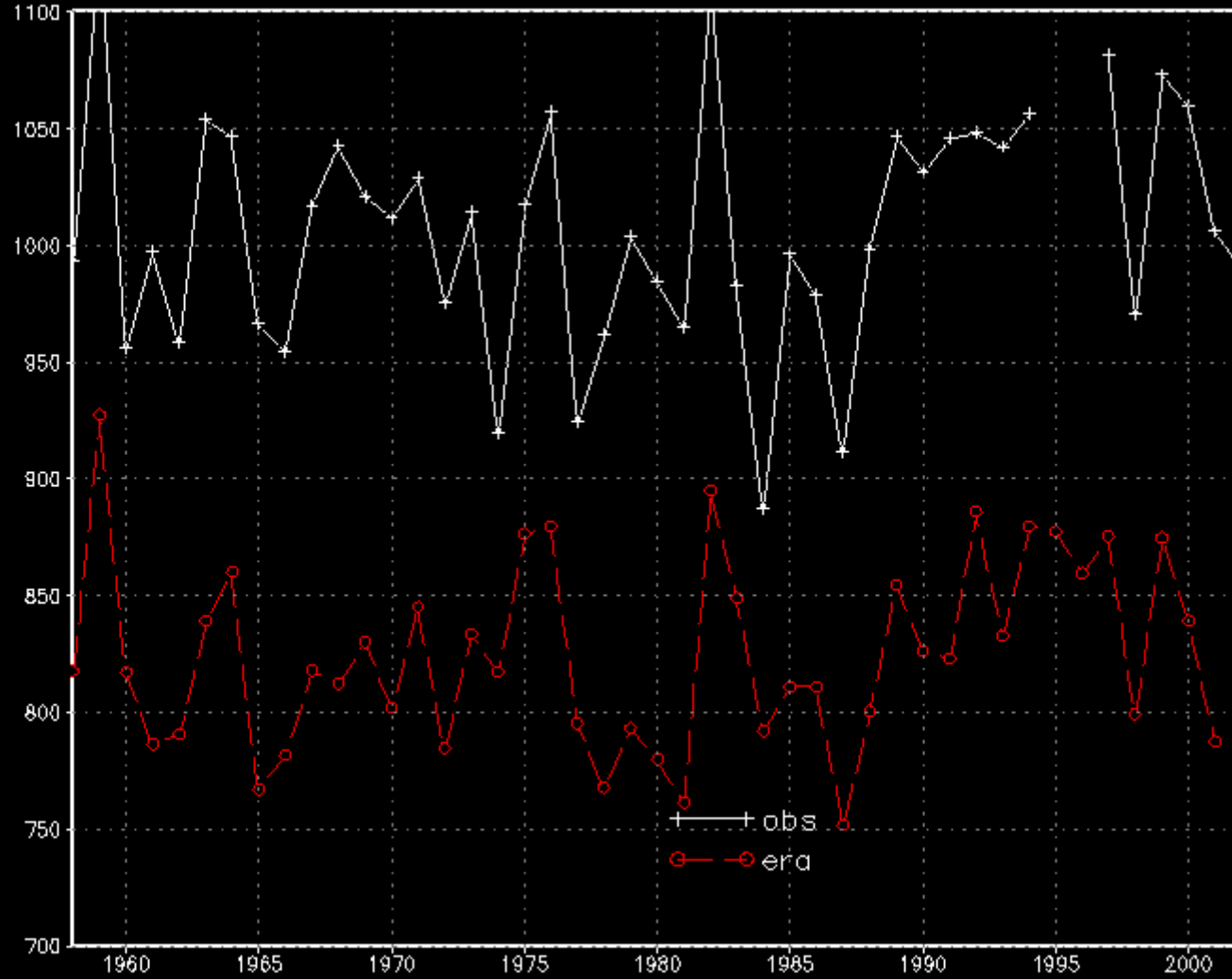


Measuring sites



Potsdam Annual global radiation

note: era is net, obs is downwelling



Potsdam Annual global radiation
note: era is net, obs is downwelling

