An assessment of the homogeneity of the aa data series at the end of the 1950s

Michel Menvielle

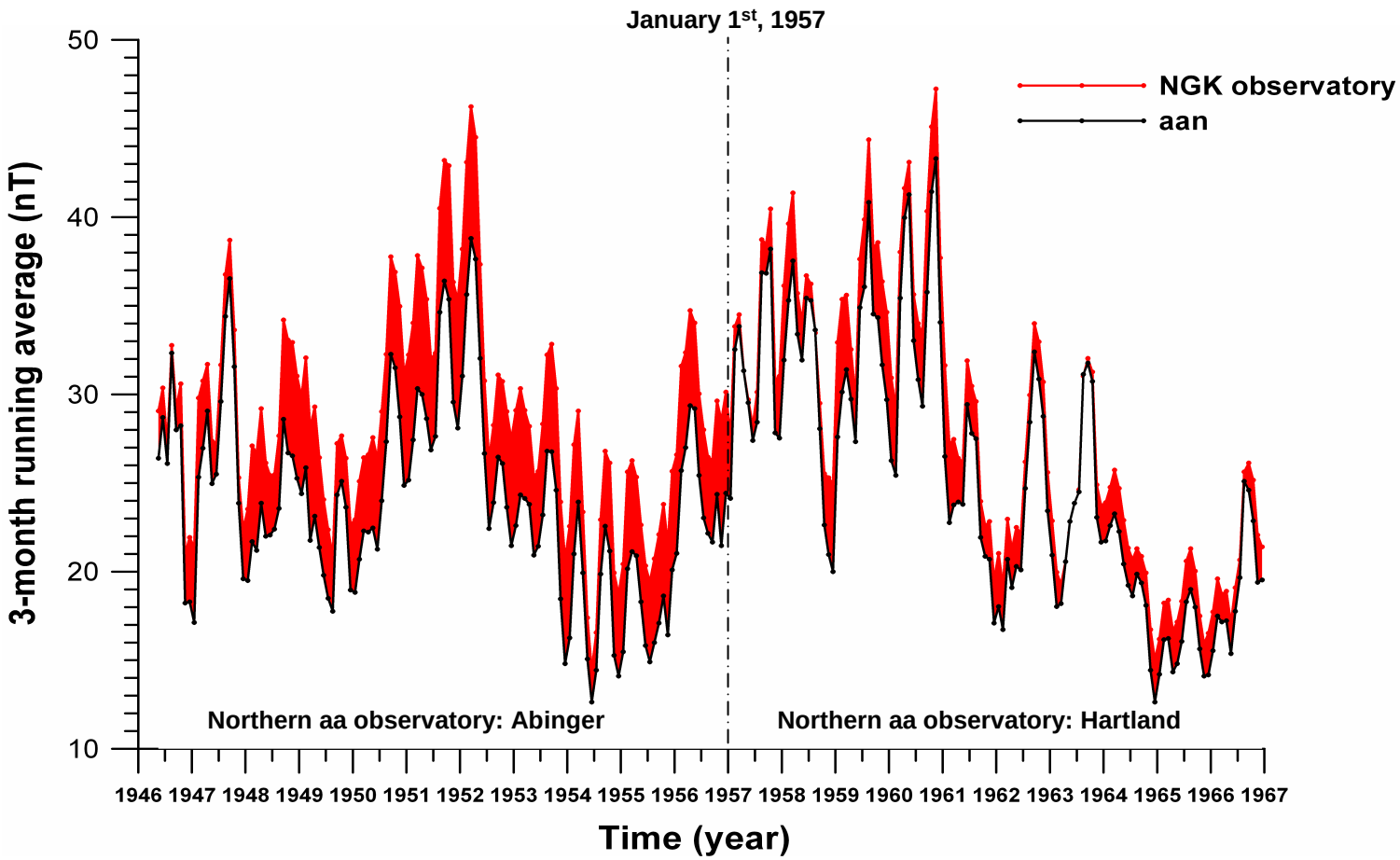
C.E.T.P., 4 Avenue de Neptune, F-94107 Saint Maur Cedex, France, and
Univ. Paris Sud, Orsay, France
michel.menvielle@cetp.ipsl.fr

michel menvielle

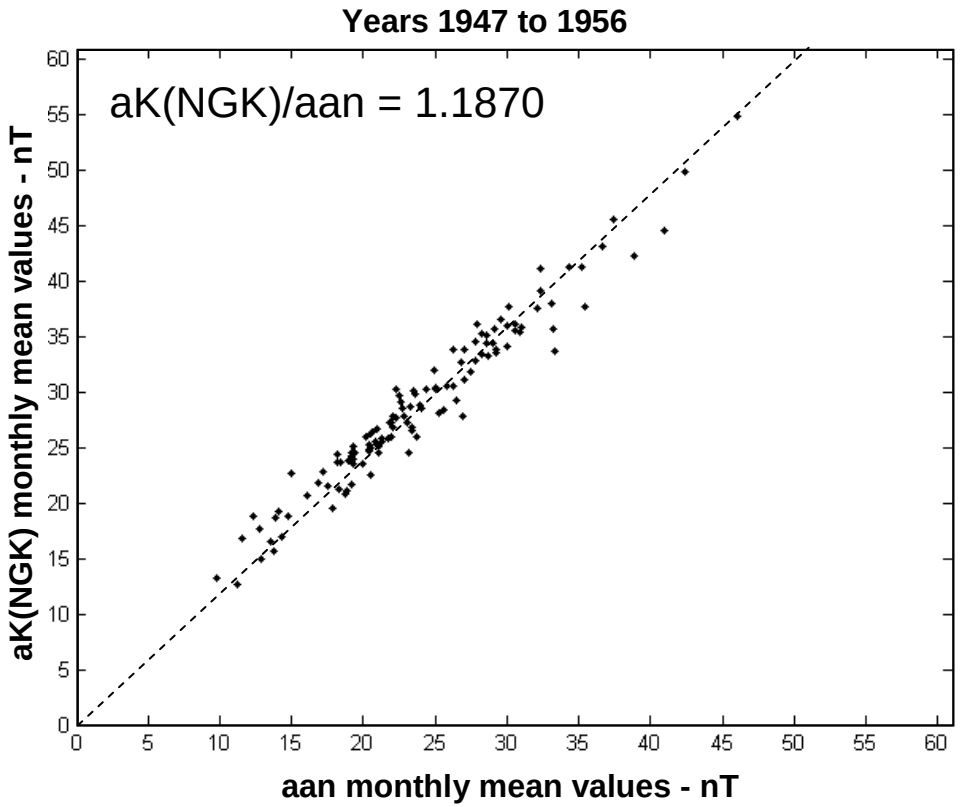
XIIIth Workshop on Geomagnetic Instruments,
Data Acquisition and Processing
Golden, Colorado – June 9 – 18, 2008

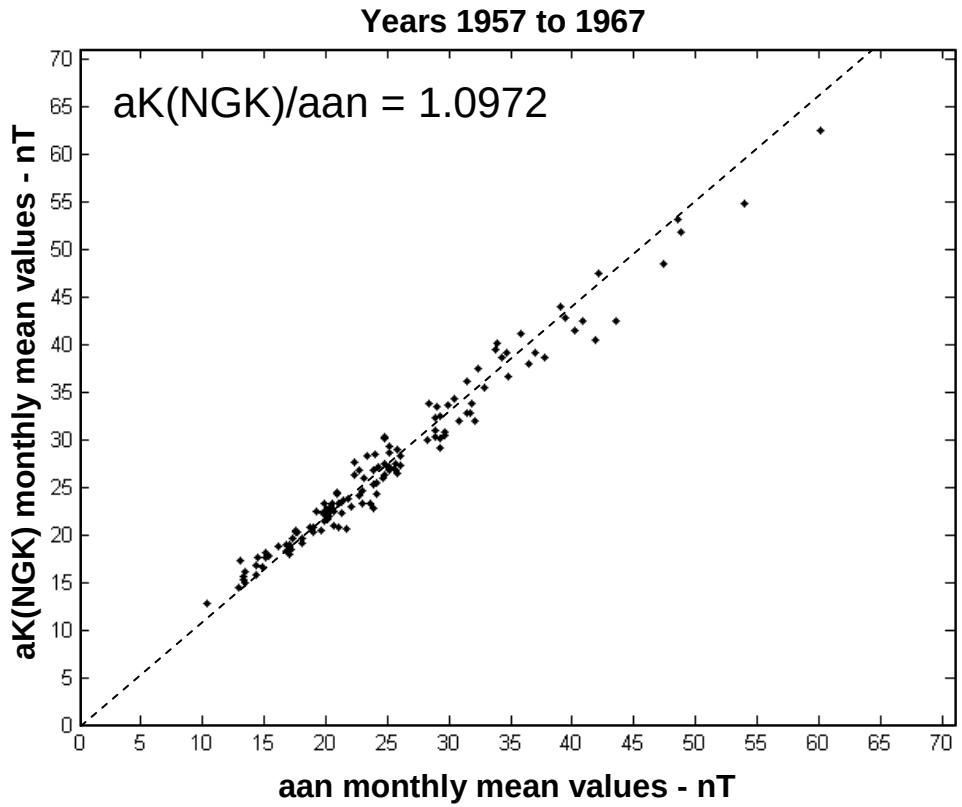
ISGI
acknowledges
CNES support

The comparison between aan and aK(NGK)…



… clearly suggests that something occurred in 1957





The present aa normalization

- On 1957, January 1st, Hartland replaced Abinger as northern aa observatory.
- P.-N. Mayaud used K indices from the neighbouring observatory of Chambon la Forêt to estimate the effect of the change; he considered periods with relatively high activity level, two years before the change of site, and two after:

aK(ABI)/aK(CLF)		**aK(HAD)/aK(CLF)**	
1941	1942	1959	1960
1.198	1.193	1.092	1.090
1.195 ± 0.003		**1.091 ± 0.001**	

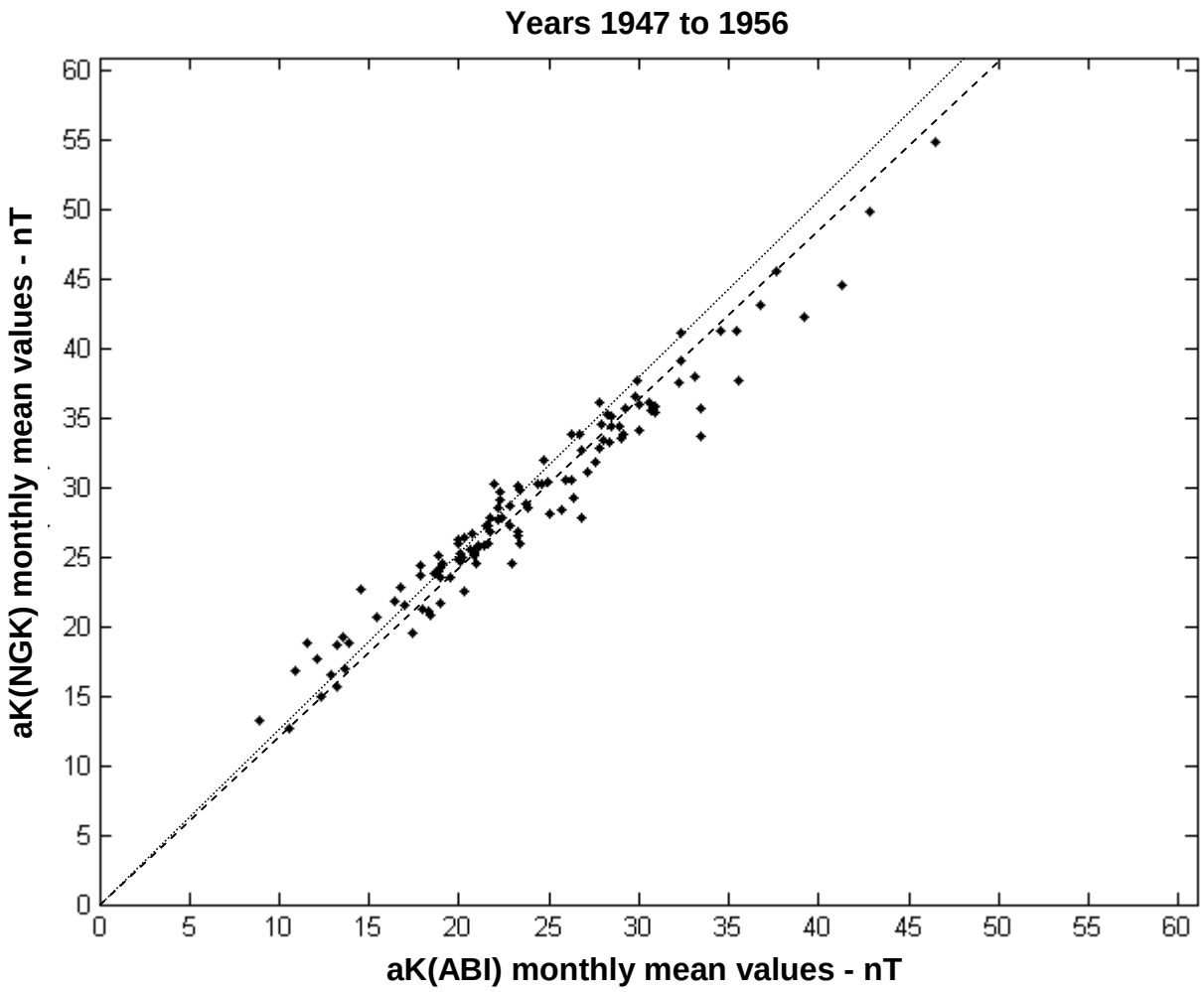
Comparison between Abinger and Niemegk

-------- Empirical linear fit:
aK(ABI) / aK(NGK) = 0.8286

Statistics on monthly mean values:
aK(ABI) / aK(NGK) = 0.8154 ± 0.0634

Statistics on yearly mean values:
aK(ABI) / aK(NGK) = 0.8197 ± 0.0377

Whole time period:
aK(ABI) / aK(NGK) = 0.8222



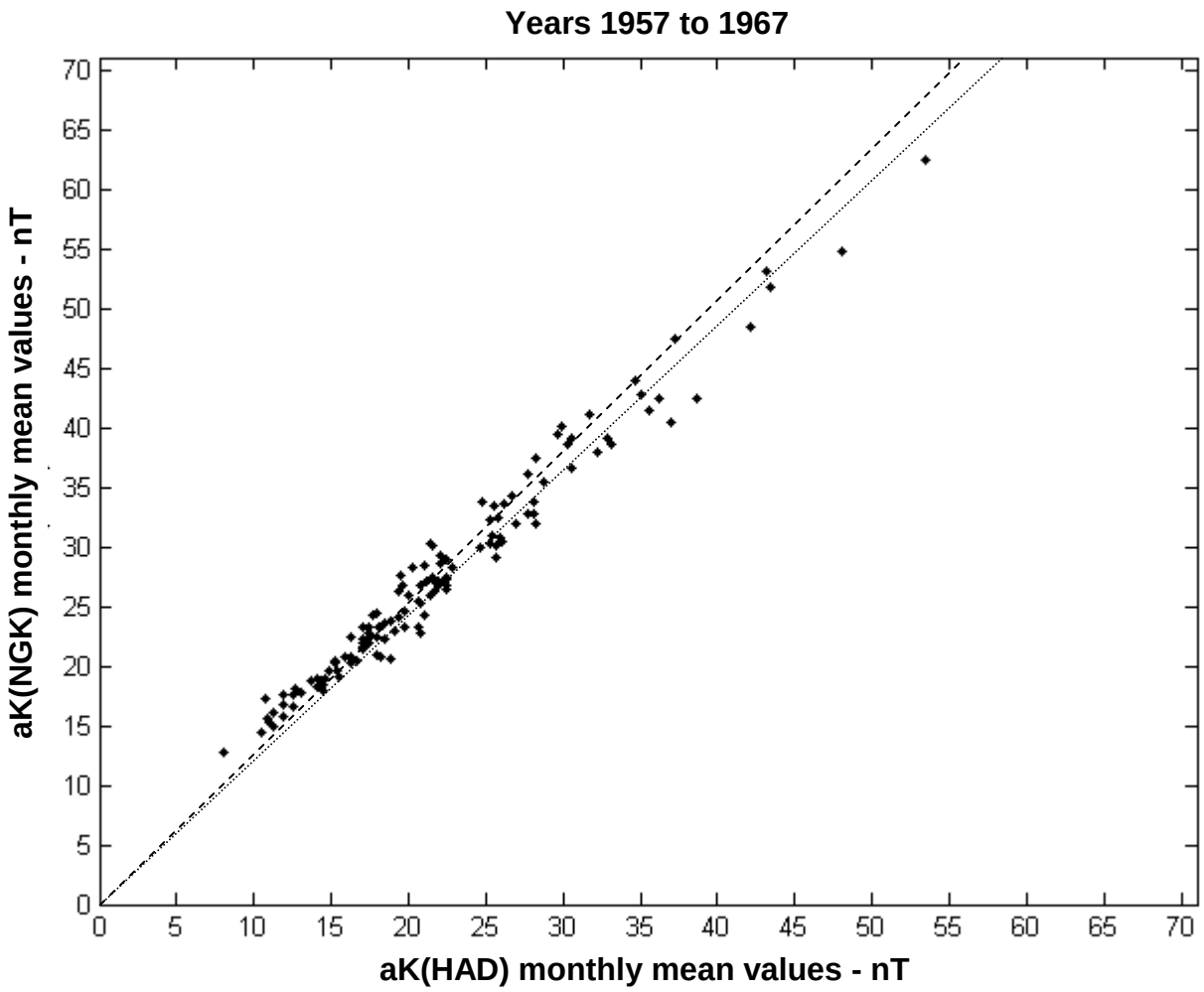
Comparison between Hartland and Niemegk

-------- Empirical linear fit:
aK(HAD) / aK(NGK) = 0.7941

Statistics on monthly mean values:
aK(HAD) / aK(NGK) = 0.7895 ± 0.0555

Statistics on yearly mean values:
aK(HAD) / aK(NGK) = 0.7951 ± 0.0276

Whole time period:
aK(HAD) / aK(NGK) = 0.7978



Summary

	1941-1942 1959-1960 Ref: CLF	1947-1956 and 1957-1967 – Ref: NGK			
		Empirical linear fit	Statistics		Whole time int.
			Monthly mean val.	Yearly mean val.	
Estimated aK(ABI)/aK(Ref)	1.195 ± 0.003	0.8286	0.8154 ± 0.0634	0.8197 ± 0.0377	0.8222
Estimated aK(HAD)/aK(Ref)	1.091 ± 0.001	0.7941	0.7895 ± 0.0555	0.7951 ± 0.0276	0.7978
Estimated aK(HAD)/aK(ABI)	1.135	1.043	**1.033**	**1.026**	**1.031**

Conclusion

- The intensity in the irregular variations at Abinger and Hartland is smaller at than at Niemegk, while it is larger than at Chambon-la-Forêt. This is likely to be related to underground induced effects (conductivity anomalies).
  - This put question on the use of only one station as reference for calibrating geomagnetic indices dealing with irregular activity.
- Because of the variability with time of the irregular activity, it is necessary to use data series over at least one solar cycle to get a reliable calibration.

What's next?

- Estimate standardization coefficients using long data series (at least one solar cycle before, and one after the date of change) from a network of neighbouring observatories located at about 50° corrected geomagnetic latitude.
- Objective: to have a corrected aa data series ready for the next IAGA meeting, in Sopron.