



UNIVERSITY OF AMSTERDAM

UvA-DARE (Digital Academic Repository)

The Application of Magnetic Methods for Dutch Archaeological Resource Management

Kattenberg, A.E.

[Link to publication](#)

Citation for published version (APA):

Kattenberg, A. E. (2008). *The Application of Magnetic Methods for Dutch Archaeological Resource Management*. Amsterdam: Amsterdam Institute for Geo and Bioarchaeology, Vrije Universiteit

General rights

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <http://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

UvA-DARE is a service provided by the library of the University of Amsterdam (<http://dare.uva.nl>)

Download date: 25 Sep 2017

Contents

Preface and acknowledgements	ix
1 Introduction	1
1.1 A magical method?	1
1.2 Aims and objectives	3
1.3 A Dutch perspective	3
1.4 This study	4
2 Archaeological prospection in The Netherlands	7
2.1 Introduction	7
2.2 The history of archaeological prospection in The Netherlands	9
2.3 The history of archaeological prospection from an international perspective	12
2.4 Archaeological prospection in The Netherlands	13
2.5 Conclusion	14
3 The principles of the application of magnetic methods for archaeological prospection focused on The Netherlands	15
3.1 Introduction	15
3.2 Different types of magnetism	15
3.3 Magnetic susceptibility	16
3.4 Soil iron oxides	17
3.5 Enhancement of magnetic susceptibility	18
3.6 Magnetic susceptibility in The Netherlands	20
3.7 Induced magnetization	22
3.8 Remanent magnetization	24
3.9 Magnetic anomalies	24
3.9.1 Direction of magnetization	24
3.9.2 Size and shape	25
3.10 Post depositional processes	27
3.11 Conclusion	28
4 Methodology	31
4.1 Choice of sites	31
4.2 Inventory of sites	32
4.3 Instruments	35
4.3.1 Magnetometer survey	35
4.3.2 Fluxgate magnetometer	35
4.3.2.1 Geoscan FM36 fluxgate gradiometer	35
4.3.2.2 Bartington GRAD601 fluxgate gradiometer	36
4.3.3 Magnetic susceptibility	36
4.3.3.1 Agico KLY-2 magnetic susceptibility bridge	36
4.3.3.2 Bartington MS2B susceptibility meter	37
4.3.3.3 Fractional conversion	37

4.3.4	Thermomagnetic, IRM and ARM measurements	37
4.3.4.1	Thermomagnetic measurements	37
4.3.4.2	Anhyserectic remanent magnetization (ARM) measurements	38
4.3.4.3	Isothermal remanent magnetization (IRM) measurements	38
4.4	Software	38
4.4.1	Geoplot	38
4.4.2	Archeosurveyor	39
4.4.3	Further software	39
5	Estuarine deposits	41
5.1	Introduction	41
5.2	The mapping of a peat-extraction landscape	41
5.2.1	Introduction	41
5.2.2	The problem	41
5.2.3	Methods for the investigation of former peat extraction	43
5.2.4	The use of geophysical methods for the investigation of former peat extraction	44
5.2.5	Sites	45
5.2.6	Methodology	46
5.2.7	Results	47
5.2.8	Discussion	48
5.2.9	Conclusion	49
5.3	Archaeological prospection of the Dutch estuarine landscape by means of magnetic methods	50
5.3.1	Introduction	50
5.3.2	Archaeology and geology	51
5.3.3	Methodology	51
5.3.4	Results	52
5.3.5	Discussion	55
5.3.6	Conclusion	56
5.4	Iron compounds from archaeological features in estuarine deposits, examples from The Netherlands	57
5.4.1	Introduction	57
5.4.2	Background	57
5.4.2.1	Magnetic susceptibility	57
5.4.2.2	Enhancement of topsoil	59
5.4.3	Methods and materials	60
5.4.4	Results	67
5.4.5	Discussion	71
5.4.6	Conclusion	75
6	Wind blown and fluvial deposits	77
6.1	Wind blown sands	77
6.1.1	Magnetic susceptibility of the cover sands	78
6.1.2	Magnetic anomalies in the cover sands	80
6.1.3	Masking	80
6.1.4	Variability	82
6.1.5	Magnetic susceptibility of coastal dunes	84
6.1.6	Magnetic anomalies in coastal dunes	86
6.2	Loess	86
6.2.1	Magnetic susceptibility	87
6.2.2	Magnetic anomalies	87
6.3	Fluvial deposits	88
6.3.1	Magnetic susceptibility	89
6.3.2	Magnetic anomalies	90
6.4	Conclusions	91

7	Magnetic mapping of archaeological features in The Netherlands	95
7.1	Settlements	95
7.1.1	Pits	95
7.1.2	Ditches	97
7.1.3	Walls	98
7.1.4	Wells	99
7.2	Off-site	99
7.2.1	Plough marks	99
7.2.2.	Ditches	100
7.2.3	Watering pits	101
7.3	Funerary structures	101
7.3.1	Graves	101
7.3.2	Tumuli (ring gullies)	102
7.4	Industrial	102
7.4.1	Peat ties and extraction pits	102
7.4.2	Furnaces	103
7.5.	Infrastructure	104
7.5.1	Roads	104
8	Discussion	105
8.1	Methodology	105
8.2	Contrasts in magnetic susceptibility	106
8.3	Estuarine and marine deposits	107
8.4	Wind blown deposits	108
8.5	Fluvial deposits	109
8.6	Magnetic anomalies unrelated to the geological environment	109
9	Conclusion	111
9.1	Principles of magnetic prospection	111
9.2	Magnetic contrasts in different geogenetic environments	112
9.3	Masking and variability	112
9.4	Iron sulphide formation	113
9.5	Returning to the objectives	114
9.6	The integration of magnetometry into ARM	114
9.7	The application of magnetic methods	115
	Appendix I Fact sheets	117
	Introduction	117
1	Beugen	117
2	Beugen	118
3	Broekpolder	123
4	Deil	127
5	Den Dolder	128
6	Breda	130
7	Borgharen	133
8	Harnaschpolder	136
9	Harnaschpolder, north, south and east	139
10	Heeten	143
11	Kolhorn	145
12	Limmen	147
13	Meerssen	151
14	Meteren	154
15	Oostende (Belgium)	157
16	Ossensisse	158

17	Poeldijk	161
18	Polre	163
19	Raalte	165
20	Slabroek	166
21	Smokkelhoek	168
22	Spalding (United Kingdom)	171
23	Stede Broec	175
24	Steenbergen	177
25	Swalmen	179
26	Uitgeest	180
27	Uitgeesterbroek	181
28	Valkenisse	183
29	Wijk bij Duurstede	186
30	Zaltbommel	187
31	Zwaagdijk Oost	189
Appendix II Laboratory data		193
1	Heating experiments	193
2	Curie Balance measurements	196
2.1	Introduction	196
2.2	Sample selection	197
2.3	Methodology	197
2.4	Results	198
3	IRM component analysis	207
Appendix III Hand augering data		209
References		219
Samenvatting		225