

DISSERTATIO ACADEMICA

QUANTITATES QUASDAM PRO LOCIS QUITIBUS-
DAM ET SPECULIS ASTRONOMICIS CONSTAN-
TES, AD COMPUTANDAS OCCULTATIONES
STELLARUM ET ECLIPSES SOLIS IDONEAS,
SISTENS,

QUAM

CONSENSU AMPLISS. PHILOSOPHORUM ORDINIS IN UNI-
VERSITATE CÆSAREA LITTERARUM ABOËNSI

M O D E R A N T E

Mag. JOH. FREDR. AHLSTEDT,

Mathem. Professore Publ. & Ord. Fac. Phil. p. t. Decano,

P R O L A U R E A

A D P U B L I C U M D E F E R T E X A M E N

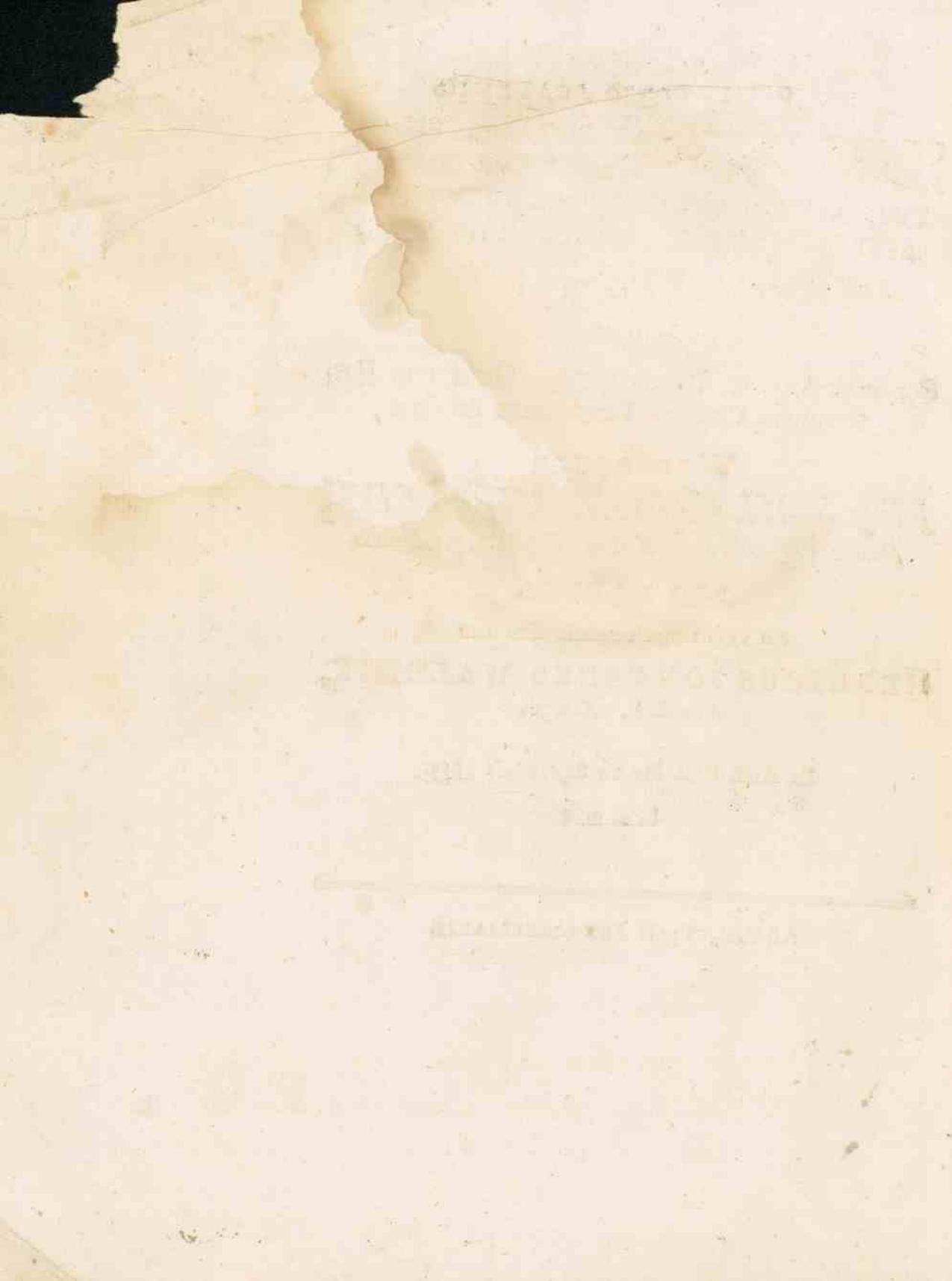
H E N R I C U S J O H A N N E S W A L B E C K ,

Stip. Publ. Aboënsis.

In Aud. Phil. die 20 Septembris 1815;

h. 2. m. c.

ABOË, Typis FRENCKELLIANS.



Amplissime ab aliis celebratae esse professor, C.
nis philosophorum id molitus haec attendunt
cane Maxime spectabilis factor affirmatissime

Auctori hujus dissertationis clarissimo
rent gerere cupione parte, quas ei plauit mibi in
pere, suscepit me istud eis majorum habens rati-
nem, quam vel studiorum meorum a materia pri-
marij linda ~~longe~~ diversiarum distinxisse, vel ne-
tiorum, quo me pugnare diffincentia ad hanc ac
arcingi hanc passa fuit. Considerans digne metu in op-
arena captiui mihi Tu Amplissime vir omni huic
putationi prehendit, ne dñe yes aures taciles facias
qui maxime estimantur, omni qua de celo verbosum
rogo honore.

Ad Te, Clarissime mei condidite non longa
hi est prælamine. Tanta enim est animi tui serice
in amicitia solida quanta in artibus doctrinisque
et imprimitis in sublimi illa estromomea fuentes pro-
vendi mentis acies et perspicacca. Num igitur & novi
documentis probatum ^{is} quoniam signis ^{meis} per viventi quod te ja
spectat trahit, factis ^{subito} miscellis membris vel studioru-
morum diversitatis vel temporis angustis tribus fin
pro meditata, quas forte alterius sum circa desertationem
laudatam obprobriis, minces comite minasque solidi invenies

Formulas pro hoc calculo ⁱⁱ (ab aliis bauer etiam Bradisius, Leo Salter
(Dresd. 1781, 1782), Cagnoli, Robbe (Theorie der Parallelverschiebung), Werner
praktische Auctio 2. Parallelverschiebung), Preccari ^{in libro de} Vni d. Sonderburgensis 1764.
aliquae Civitatis marinis Clavigeris iam prototypo & Lectori in Opusculis Bergmanni
per le per. Maxima est ut ^{probabiliter} ^{probabiliter} ^{probabiliter} ^{probabiliter} ^{probabiliter} ^{probabiliter}
Hegel ab alia doctrina ratione non sit probata, scimus
quoniam hanc rationem ab auctoritate postea nupti, quemdam ^{etiam} locum reuelationis ad eam, ut
pane de pane de pluvia vocat plaga formula cum modicione in auctoritate
tenet.

prodi sumatis hoc in nota formulae car. Precipit - ubi tabulariis s' habet
h' occultatio nibus fixarum maxime idonea id quod et ope latitudine solleto
id minor car non illius formula non est usq' luminis tabulei andea confundit
ut rotaritis rotaceos confundit lib' hispotem - Et h' cum nofus t' ex
calibrationes et valores pro latitudine s' habent cum tabulis aliorum non
convenire de hinc etiam alia via tentar; - si jam h' non placet
et id est id non debet et occipit non decuitas putamenis hanc obtundit
s' et locum ubi coronariit per mult' Precipit


Inter diversa phænomenorum cælestium genera ad invenientias meridianorum differentias primum occupant occultationes stellarum a Luna, haudque infimum eclipses etiam Solis ab hac vel planetis inferioribus locum, quorum calculo inserentes formulas plurimi præstantissimi Viri, LAGRANGE, LEXELL, DUSEJOUR, BOHNENBERGER, DELAMBRE, OLBERS & LITTRROW a) publici juris fecerunt. Plurimæ harum facile ab aliis possunt derivari, neque tamen omnes practico respectu ejusdem sunt commoditatis. Inter has diversas methodos, ut quidem mihi videtur, brevissime forsitan usurpatur vel ea quæ a BOHNENBERGER (Geogr. Ortsbest. pagg. 339 & 345) ope nonagesimi traditur, vel præstantissima illa ab OLBERS (Astron. Jahrb. 1811) proposita. Etsi vero OLBERS & LITTRROW methodos etiam tradiderunt calculum parallacticum tam respectu Ascensionis rectæ & Declinationis, quam altitudinis & azimuth peragendi, elegantiorum tamen hæ formulæ analyticam formam, quam commodiorem practicum habent usum. Sunt enim Loca Lunæ respectu ecliptices in tabulis data, & motus ejus ad æquatorem

A

torem

a) Neque silentio prætereundæ sunt formulæ Clar. BESSER, quibus datis veris Lunæ ad eclipticam relatis positionibus, apparentes Ascensiones Rectæ & Declinationes mox computantur. Hæc methodus calculandis e tabulis occultationibus fixarum maxime est idonea,

torem relatus magis inæqualis est quam ad eclipticam. Porro, si eclipses stellarum vel Solis ad horizontem computantur, major requiritur labor, cum loca, quæ in tabulis ad Eclipticen referuntur, primo ad æquatorem, mox ad horizontem reduci debeant. Quid? quod in computandis ad usus geographicos phænomenis his, hæc ultima methodus minime est idonea, & usus hujus tantum ad eos casus restringitur, ubi e tabulis tantum & elementis e theoria datis calculantur eclipses. In usum eorum, qui forsan unam alteramve harum formularum, BOHNENBERGERIT sc. & OLBERSIT non viderunt, eas hic afferam. Designent L , λ , D , Longitudinem, Latitudinem & Radium Lunæ (vel Solis^c) veram, L' , λ' , D' , easdem apparentes, β Latitudinem loci geocentricam, ε Ecliptices obliquitatem; α Tempus sidereum (cum Nut. in A. R.), p Parallaxem Longitudinis, π parallaxem horizontalem æquatoream, ϱ radium terræ ad æquatoris relatum, & erit secundum BOHNENBERGERI:

$$\sin b = \sin \beta \cos \varepsilon - \cos \beta \sin \varepsilon \sin \alpha$$

$$\sin N = (\sin \beta \sin \varepsilon + \cos \beta \cos \varepsilon \sin \alpha) \sec \beta.$$

$$Tg\ p = \frac{\varrho \sin \pi \cos b \sin (L - N)}{\cos \lambda - \varrho \sin \pi \cos b \cos (L - N)}$$

$$Tg\ \lambda' = \frac{(\sin \lambda - \varrho \sin \pi \sin b) \cos p}{\cos \lambda - \varrho \sin \pi \cos b \cos (L - N)}$$

$$\sin D' = \frac{\cos p \cos \lambda' \sin D}{\cos \lambda - \varrho \sin \pi \cos b \cos (L - N)}$$

Forz

^a) Parallaxis Longitudinis Solis & Lat. app. ope priorum calculentur formularum, quæ tum insignem abbreviationem admittunt, Pro Sole & planetis est $D' \equiv D$.

Formulae Olbersianæ hæc b) sunt

$$\text{Tang } L' = \frac{\sin L \cos \lambda - \varrho \sin \pi (\sin \alpha \cos \beta \cos \varepsilon + \sin \beta \sin \varepsilon)}{\cos L \cos \lambda - \varrho \sin \pi \cos \alpha \cos \beta}$$

$$\text{Tg } \lambda' = \frac{[\sin \lambda - \varrho \sin \pi (\sin \beta \cos \varepsilon - \sin \alpha \cos \beta \sin \varepsilon)] \cos L'}{\cos L \cos \lambda - \varrho \sin \pi \cos \alpha \cos \beta}$$

$$\text{Sin } D' = \frac{\sin D \cdot \cos L' \cos \lambda'}{\cos L \cos \lambda - \varrho \sin \pi \cos \alpha \cos \beta}.$$

Labor calculandi eclipses in his duabus methodis fere idem est, id vero commodum non negligendum, quod Bohnenbergerianæ tantum cum quinque vel sex ad summum figuris decimalibus logarithmorum computentur, quod etiam valet de partibus posterioribus duarum primarum OLBERSIR & tota tertia formula, ubi præterea, prima, cum apparet tantum longitudo detur, summa cura e tabulis trigonometricis supputetur. Perspicuum est, in utraque methodo (si Nonagesimus per allatas formulas computatur) calculum breviorem reddi, si quantitates constantes $\sin \beta \cos \varepsilon$, $\sin \beta \sin \varepsilon$, $\log \cos \beta \cos \varepsilon$, $\log \cos \beta \sin \varepsilon$ & ϱ seu etiam $\log (1 - \varrho)$ pro diversis locis e tabula depromi possint, quare igitur non inutile duxi, has pro quibusdam speculis astronomicis, & locis aliquot borealibus, quorum Longitudines ex observatis occultationibus computare forsitan si fata tulerint, in animo est, heic sistere & in communem usum promulgare.

Necesse est, ut maxime probabilis in hoc calculo assumatur valor ellipticitatis telluris. Hic diversis modis, secum in-

A 2 vicem

b) *Astr. Jährb. 1811*. Quæ in *Astr. J. B. 1808* occurunt, forsitan non tam commodæ sunt, saltem eam abbreviationem calculi non admittunt.

wicem bene consentientibus prope $\frac{1}{303}$ constituitur. Verissimum est, graduum mensuras multum a se invicem ab ludere, verumque ita est, paucis m. secundis in Latitudinibus extre- morum arcus mensurati pondorum mutatis, vel etiam variatis quam minime longitudinibus basium (quæ s^æpē admodum breves fuerunt), omnes ad eandem posse ellipticitatem reduci. Combinatio vero omnium, (quæ vero plurimæ non ita sunt accuratæ, ut certitudinem $1''$ in Latitudinibus, cum adhuc major præcisiō ad hunc usum necessaria esset, habeant), Cl^o LINDEAU dedit $\frac{1}{302}$ c); mensuraque gallica novissima duce DELAMBRE & MECHAIN cum suecana a SVANBERG peracta comparata, quæ ambæ sine dubio accuratissimæ sunt $\frac{1}{307}, \frac{1}{307}$ d); Duæ æquationes Lunares, quod notum est, una in Longitudine, altera in Latitudine, quarum coëfficientes a Bürg empirice sunt determinatæ, $\frac{1}{307}$; & ex 29 selectis pendulorum observationibus ab HALSTRÖM e) ad calorem 0° & spatium aëre vacuum correctis formula pro longitudine penduli sexagesimalis per methodum minimorum quadratorum sequitur $439,230 + 2,343 \sin \beta^{12}$ lin. paris., quæ ellipticitatem requirit $\frac{1}{304}$. Præterea novissima gallica mensura ad finem perducta bene cum valore $\frac{1}{307}$ consentit, cum longitudine arcus meridiani inter Formenteram & Dunkerque ex observationibus tantum 0,41 metris diversa ab ea, quam dicta hæc ellipticitas poscit, inventa sit f).

In sequentibus igitur assumsi valorem $\frac{1}{303}$, quo posito, Latitudo apparet & vera sint β' & β , quo habeatur $Tg \beta = (\frac{1}{303})^2$

c) v. ZACH Mon. Correspondenz 1806, Aug.

d) SVANBERG Mesure d'un arc du Meridien, Préf. pag. XXVIII.

e) Dissert. de Fig. Tell. ope Pendul. determinanda P. III. pagg. 9, 10. P. V. pagg. 3, 4.

f) BODE Astron. Jahrb. 1813. pag. 252.

$(\frac{104}{107})^2$ Tang β' , & logarithmus hujus coëfficientis (Logarithmis fractionum propriarum semper denario auditis) = 9,9971476, vel etiam

$$\beta' - \beta = 677'' \text{, } 4 \sin 2 \beta' = 1'', 1 \sin 4 \beta', \text{ ubi Log. Coëff.}$$

sunt 2,83085 & 0,046. Ad calculandum ρ sequentes inserunt formulæ, approximatoriæ quidem, sed eandem præbentes præcisionem, quam formulæ rigorosæ ope usitatarum tabularum trigonometricarum:

$$\rho = 1 - 0,00325189 \sin \beta'^2 - 0,00002658 \sin \beta'^4 \\ (\text{Log. } 7,512135; 5,4245).$$

$$\text{Log. } \rho = 10 - 0,00141228 \sin \beta'^2 - 0,00001384 \sin \beta'^4 \\ (\text{I. } 7,149920; 5,1408).$$

$$\text{Log. } (1 - \rho) = \text{Log. } \sin \beta'^2 + 7,512135 + p \sin \beta'^2 - q \sin \beta'^4. \\ \text{Log. } p = 7,5502; \text{ Log. } q = 5,463.$$

Hæc ultima formula, reliquarum commodissima, ea est, cum qua tabellam construxi. Est vero, si $\pi =$ par. æqu., $\pi' =$ loci, accurate $\sin \pi' = \rho \sin \pi$, non vero exakte $\pi - \pi' = (1 - \rho) \pi$, error vero, qui ordinis quinti est, in nullo casu ultra 0'',01 ascendit.

Exhibet igitur sequens tabella valores antea nominatos, adjunctis eorum variationibus pro diff. 10'' in ϵ & β , cuius quidem variatio insensibiliter differt a variatione τς β' si hæc 30'' seu 40'' minor g), præsertim si hæc omnia ad sex figuræ decim. logarithmicas computentur, quod abunde sufficit, cum variatio

Log

- g) Probat hoc formula approximatoria: $\Delta (\beta' - \beta) = 0'',00657$
 $\cos 2 \beta' d \beta' = 0'',00005 \cos 4 \beta' d \beta'$, ubi $d \beta$ in secundis exprimitur.

Log. Sin π etiam pro $\pi = 62'$ & pro $0'',01$ unitatem in sexta figura excedat. Et si parallaxis Lunæ tantum ad $0'',1$ datur, quinque sufficiunt figuræ. Cum omnes novissimas astronomicas Latitudinum determinationes præsertim in v. Zach M. Corr. adhuc videre mihi non licuerit, plurimas e tabulis Gothanis (1804) Solis, & recentioribus quibusdam datis assumsi.

Pello	Pullingi	Tornea	Caianebr.
66° 48' 0"	66° 38' 41"	65° 50' 49",4	64° 13' 30"
66 39 48,3	66 30 26,8	65 42 22,5	64 4 38,5
9,1979576	488 2006878	484 2143981	466 2407559
0,8422520	176 8412596	177 8360642	183 8249986
9,5603471	177 5630773	177 5767876	176 6031454
0,3656390	75 3652082	77 3629527	79 3581489
7,4419	408	7,4408	408
		7,4355	405
			7,4240 400

Hernösand.	Aboa	Sveaburg.	Petropolis
62° 37' 30"	60° 27' 15"	60° 8' 44"	59° 56' 23"
62 28 15,8	60 17 32,8	59 58 58,2	59 46 34,7
9,2649449	404 2952259	369 2993135	364 3020117
0,8134338	206 7967275	221 7942606	223 7926012
9,6273344	171 6576154	168 6617030	167 6644012
0,3531285	89 3458764	95 3448050	97 3440847
7,4117	394	7,3938	386
		7,3911	385
			7,3893 384

Upsalia	Revalia	Holmia	Scara
59° 51' 50"	59° 26' 29"	59° 20' 35"	58° 23' 42"
59 42 0,8	59 16 34,8	59 10 39,8	58 13 36,4
9,3030000	360 3084523	354 3097075	353 3215645
0,7919875	224 7885424	227 7877345	228 7798254
9,6653895	167 6708418	166 6720970	166 6839540
0,3438182	98 3423225	98 3419720	99 3385384
7,3886	384	7,3849	382
		7,3840	382
			7,3753 378

Dor-

Lacistema in tabulis a notabilissimo Path. Schultes (1802 editi)
non quadrant quoniam

63° 50' S ^{Lat.}
107° 10' E ^{Long.}
profundus

277 fathms

Hebb. 5° 20' 21" N
Plan. 18° 22' 15" E long.

Dorpat $58^{\circ} 22' 0''$

Riga. $56^{\circ} 56' 32''$

arlsruhe $55^{\circ} 10' 45''$ Marchius

Liepāja $56^{\circ} 42' 0''$ Scheumark Gorogowis

Hamburg $52^{\circ} 34' 32''$

Berlin $52^{\circ} 31' 46''$

Dorpatum	Gothoburg.	Riga	Mitavia
58° 22' 43"	57° 42' 42"	56° 57' 1"	56° 39' 6"
58 12 37,3	57 32 29,3	56 46 40,9	56 28 43,1
9,3217657	340 3298407	331 3388067	321 3422521 318
0,7796870	234 7739932	239 7673645	244 7647280 246
9,6841552	364 6922302	163 7011962	162 7046416 161
0,3384783	103 3360065	104 3331288	106 3319843 107
7,3751	378 7,36888	375 7,3613	372 7,3584 371
Carolicorona	Mosqua	Lond. Goth.	Havnia
56° 10' 8"	55° 45' 45"	55° 42' 45"	55° 41' 4"
55 59 40,7	55 36 13,9	55 32 13,7	55 30 32,4
9,3477400	312 3520984	307 3528363	307 3531466 307
0,7604215	249 7569049	251 7563010	252 7560455 252
9,7101395	160 7144879	159 7152258	159 7155361 159
0,3301148	109 3285881	109 3283259	109 3282152 110
7,3535	367 7,3492	367 7,3487	367 7,3485 367
Wilna	Dantiscum	Hamburgum	Lilienthal.
54° 41' 2"	54° 20' 48"	53° 32' 51"	53° 8' 24"
54 30 22,3	54 10 5,7	53 22 2,9	52 57 33,2
9,3640063	295 3675761	292 3758600	283 3799910 279
0,7468392	258 7436850	259 7361075	265 7321888 268
9,7263958	157 7299656	157 7382495	155 7423805 155
0,3242930	112 3228490	113 3195595	115 3178583 116
7,3379	362 7,3342	360 7,3253	357 7,3207 355
Brema	Celle	Berolinum	Ultrajectum.
53° 4' 45"	52° 37' 12"	52° 31' 15"	52° 5' 39"
52 53 53,9	52 26 17,9	52 20 20,3	51 54 41,8
9,3806023	278 3851738	274 3861513	272 3903162 268
0,7316005	268 7271350	271 7261645	272 7219636 274
9,7429918	154 7475633	153 7485408	153 7527057 152
0,3176029	116 3156644	118 3152431	118 3134194 119
7,3290	355 7,3147	353 7,3135	352 7,3085 350
Got.			

Göttinga	Londinum	Grenovicum	Lipsia
51° 31' 54"	51° 30' 30"	51° 28' 39"	51° 20' 44"
51 20 53,7	51 19 29,6	51 17 38,4	51 9 42,8
9,3957098	263 3659313	263 3962234	263 3974703 262
0,7163652	278 7161317	278 7158225	278 7144975 279
9,7580993	151 7583208	151 7586129	151 7598598 150
0,3109890	121 3108876	121 3107534	121 3101781 121
7,3018	347 7,3015	347 7,3011	347 7,2995 346
Elberfeld	Vratislavia	Dresda	Seeberg
51° 15' 40"	51° 7' 6"	51° 3' 9"	50° 56' 7",9
51° 4' 38",3	50 56 3",6	50° 52 6,3	50 45 4,8
9,3982553	261 3996039	259 4002187	259 4013073 258
0,7136478	279 7122066	280 7115422	281 7103577 281
9,7606448	150 7619934	150 7626082	150 7636968 150
0,3098094	121 3091844	122 3088951	122 3083810 122
7,2985	346 7,2967	345 7,2959	345 7,2945 344
Praga	Cracovia	Manhem.	Ratisbona
50° 5' 18"	50° 3' 40"	49° 29' 18"	49° 0' 58"
49 54 10,9	49 52 32,8	49 18 8,6	48 49 47,0
9,4090600	250 4093053	250 4144102	245 41 54 15 241
0,7016875	286 7014063	287 6954553	290 6904976 293
9,7714495	148 7716948	148 7767997	146 7809310 145
0,3046171	124 3044950	124 3019116	126 2996593 127
7,2838	340 7,2835	340 7,2761	337 7,2699 335
Par. Obs. Del.	Par. Obs. Sch. M.	Par. Obs. R.	Vienna
48° 51' 38"	48° 51' 6"	48° 50' 14"	48° 12' 36"
48 40 26,5	48 39 54,5	48 39 2,4	48 1 22,7
9,4198871	239 4199638	239 4200884	239 4254355 234
0,6888540	294 6887600	294 6886072	294 6819270 297
9,7823396	145 7823533	145 7824779	145 7878250 144
0,2990458	128 2990050	128 2989386	128 2960385 129
7,2679	334 7,2677	334 7,2676	334 7,2591 331
			Mo-

Eberfeld fine ej ps^o major laster.

Progeny off loco plan incipiens me in uero libro seu ~~descriptio~~
geogr. vivarium.

Zivary 44° 29' 4"

Madrit 40° 25' 18"

Monachium	Cremifanum	Bergavia	St. Gallen
48° 8' 20"	48° 3' 36"	48° 3' 6"	47° 25' 40"
47 57 6,9	47 52 22,8	47 51 52,2	47 14 24,9
9,4260333 234	4266970 233	4267668 233	4319403 228
0,6811655 298	6803170 298	6802273 298	6734821 302
9,7884228 143	7890865 143	7891563 143	7943298 142
0,2957080 129	2953397 129	2953008 129	2943725 131
7,2581 330	7,2571 330	7,2569 329	7,2483 326

Mediolanum	Patavium	Vivarium	Massilia
45° 27' 59"	45° 23' 40"	44° 29' 16"	43° 17' 49"
45 16 4 ,7	45 12 22,6	44 17 58,8	43 6 33,0
9,4474838 213	4480337 212	4548472 205	4634725 197
0,6517657 3 3	6509544 313	6406469 318	6268686 325
9,8098733 137	8104232 137	8172367 135	8258620 132
0,2829451 136	2825928 136	2781181 138	272366 141
7,2199 315	7,2188 315	7,2050 311	7,1862 303

Mirapicum	Neapolis	Madritum	Panormum
43° 5' 19"	40° 50' 15"	40° 24' 58"	38° 6' 45"
42 54 3,3	40 39 5,1	40 13 49,6	37 55 47,6
9,4649447 196	4801808 181	4829003 178	4970650 164
0,6244306 326	5975745 337	5924454 340	5638567 351
9,8273342 131	8425703 126	8452898 125	8594545 119
0,2710782 141	2594195 146	2571928 147	2447818 152
7,1828 303	7,1447 290	7,1372 287	7,0943 273

Expl. exhibet pro quoever loco prima & secunda linea latitudinem apparentem & veram, tertia Log Cos β Sin ε (ε vero 23° 28' assumta), adjecta variatione pro $\Delta \beta = 10''$, quæ negativa est, ubi constans variatio pro $\Delta \epsilon = 10'' = + 485$; quarta, Sin β Cos ε, subjunctis variationibus in eadem linea

B

pro

pro $\Delta \beta = 10''$ & in posteriori pro $\Delta \varepsilon$, quæ negativa; quinta Log Cos β Cos ε , cuius variatio pro $\Delta \beta$ eadem est ac in linea tertia, & ubi pro $\Delta \varepsilon = 10''$ constans variatio = — 91,4; sexta Sin β Sin ε , ubi variatio pro $\Delta \beta = 10''$ in eadem linea, & pro $\Delta \varepsilon$ in sequenti, quæ positivæ sunt, invenitur; ultima vero linea valorem Log (1 — ε) tradit.

Ad inveniendas differentias sequentes adhiberi possunt formulæ, si hæc non ope tabularum trigonometricarum, quod minus exactum est, computentur.

$d\beta$ & $d\varepsilon$ in secundis exprimendæ.

$$d(\text{Log Cos } \beta \text{ Sin } \varepsilon) = -0,4343 \text{ Sin } 1'' \text{ tg } \beta d\beta + 0,4343 \text{ Sin } 1'' \text{ Cotg } \varepsilon d\varepsilon.$$

$$d(\text{Sin } \beta \text{ Cos } \varepsilon) = \text{Cos } \varepsilon \text{ Cos } \beta \text{ Sin } 1'' d\beta - \text{Sin } \beta \text{ Sin } \varepsilon \text{ Sin } 1'' d\varepsilon$$

$$d \text{Log} (\text{Cos } \beta \text{ Cos } \varepsilon) = -0,4343 \text{ Sin } 1'' \text{ tg } \beta d\beta - 0,4343 \text{ Sin } 1'' \text{ tg } \varepsilon d\varepsilon$$

$$d(\text{Sin } \beta \text{ Sin } \varepsilon) = \text{Cos } \beta \text{ Sin } \varepsilon \text{ Sin } 1'' d\beta + \text{Sin } \beta \text{ Cos } \varepsilon \text{ Sin } 1'' d\varepsilon$$

Si $d\beta = d\varepsilon = 10''$ erit in casu nostro approximatorie, hæc quatuor differentias per $d(1)$, $d(2)$ &c. designando

$$d(1) = -N \text{ tg } \beta + 0,00004850 \quad (\text{Log } N = 5,32335)$$

$$d(2) = A \text{ Cos } \beta - B \text{ Sin } \beta \quad (\text{Log } A = 5,64808; \text{ Log } B = 5,28568),$$

$$d(3) = -N \text{ tg } \beta - 0,00000914$$

$$d(4) = B \text{ Cos } \beta + A \text{ Sin } \beta.$$

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Hic iam argumentis fabri hyperargit, perhapse finimque formis
nisi mei iam factura reliquum est, ut Te Celestissime dom
post hoc fautor ^{maximaq. quantitatis agyan} affirmati, spme ob benevolentiam et
humanitatem non hac occasione solam mihi ex-
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Quodcumque de condidate, amico dilectis
sime honorabilissimi.

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cunda sunt tempora tua, nuncquam ^{nunquam} ^{inter} desinunt,
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