Altitude correction

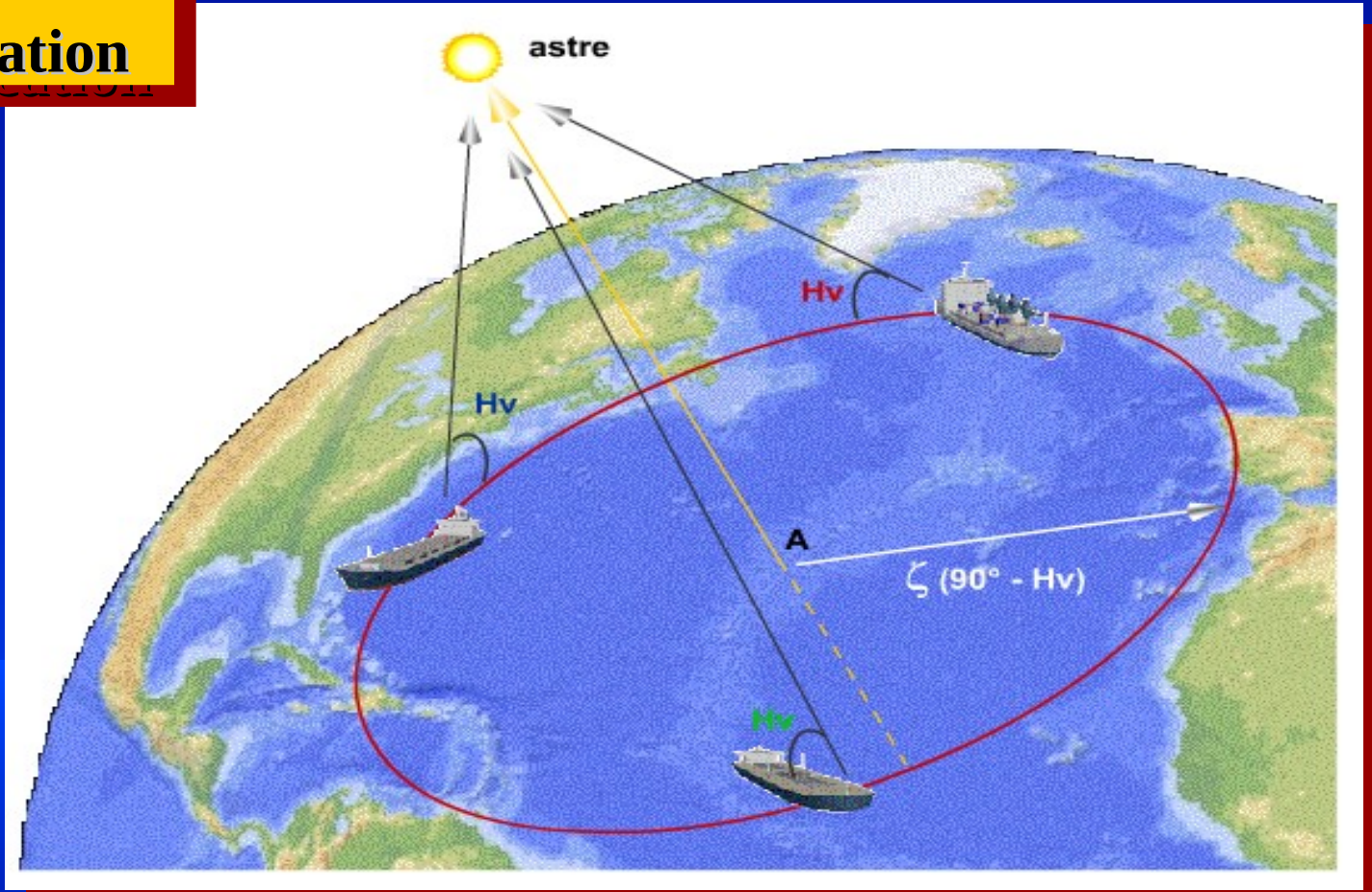
Introduction

Importance of the altitude

Altitude

#

Location

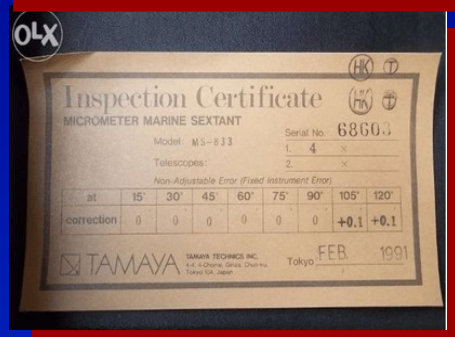


- 1 -
Factors affecting the altitude

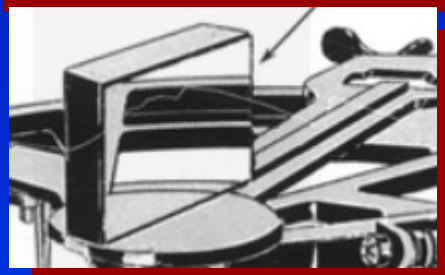
1- Factors affecting the altitude

Sextant

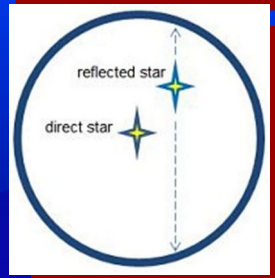
Instrument error

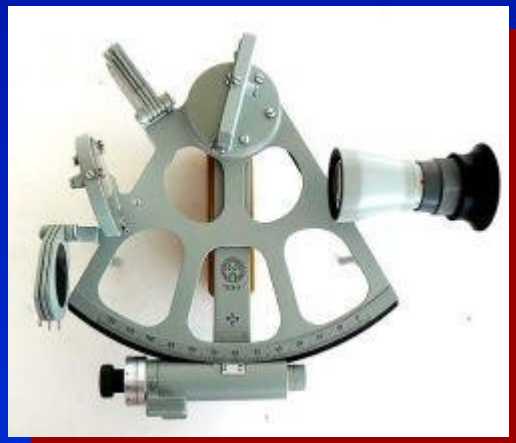


Perpendicularity Error



Side error





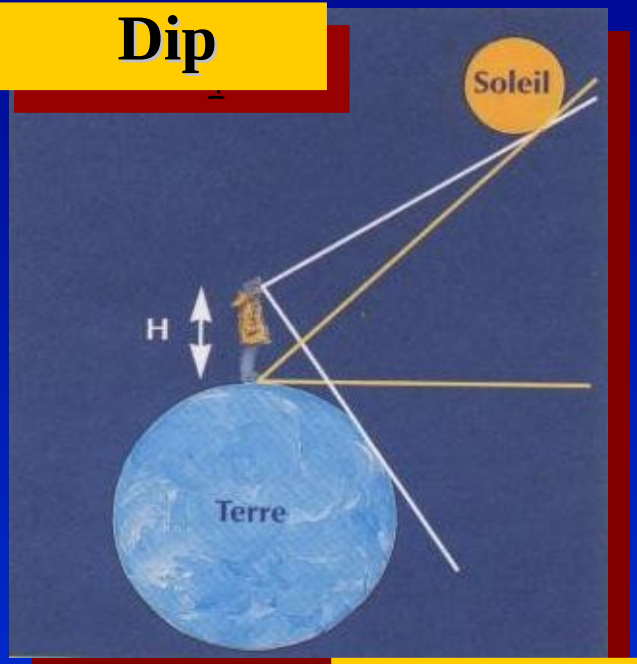
Collimation Error

Index Error (IE)

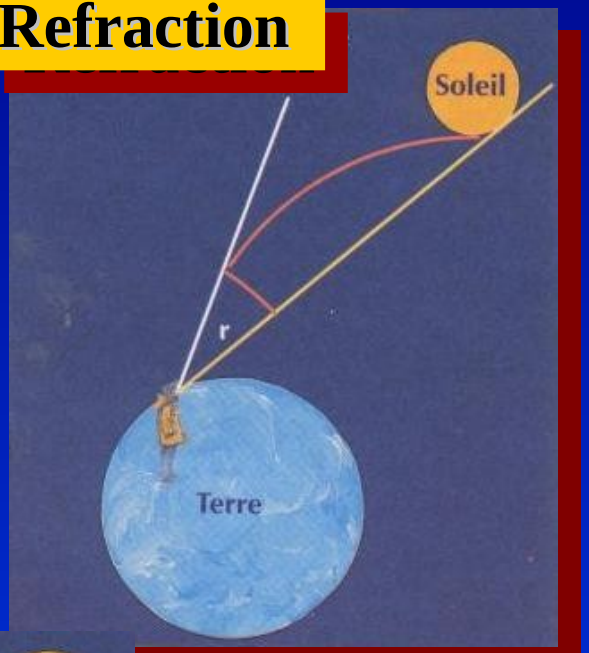
1- Factors affecting the altitude

Environnement – Altitude correction

Dip

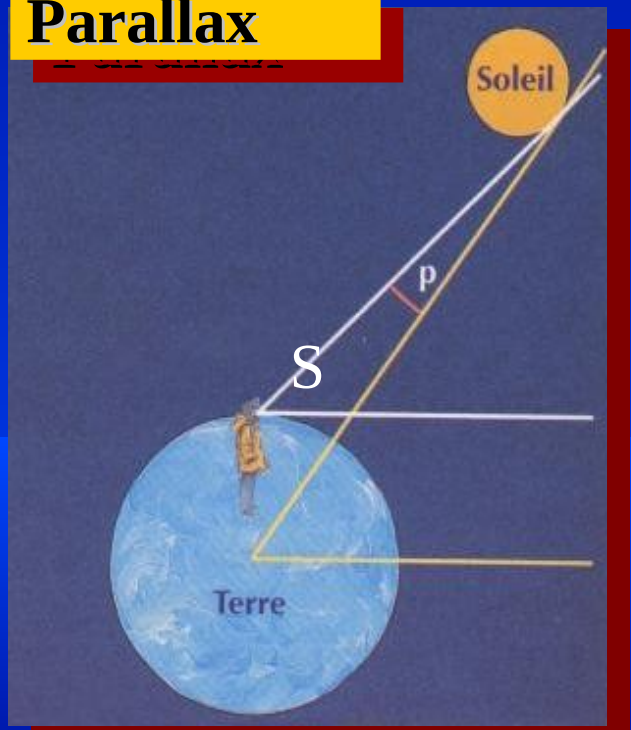


Refraction



Semidiameter

Parallax



1- Factors affecting the altitude

2- Relations between altitudes

3- Nautical almanac and altitude correction

- 2 -
Relations between altitudes

2- Relations between altitudes

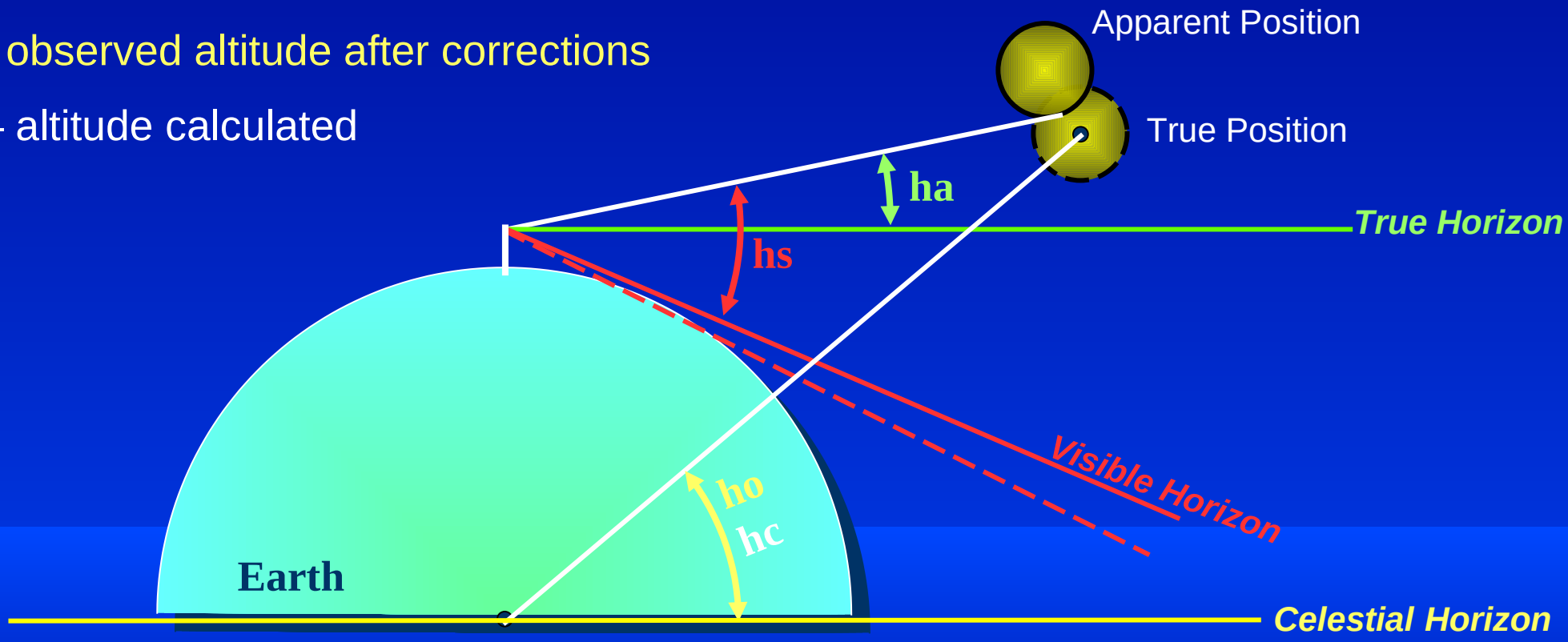
Different horizons / different altitudes

hs : altitude measured with sextant

ha : hs corrected for ‘IE’ and ‘dip’
used to enter Altitude Correction Tables

ho : observed altitude after corrections

hc – altitude calculated



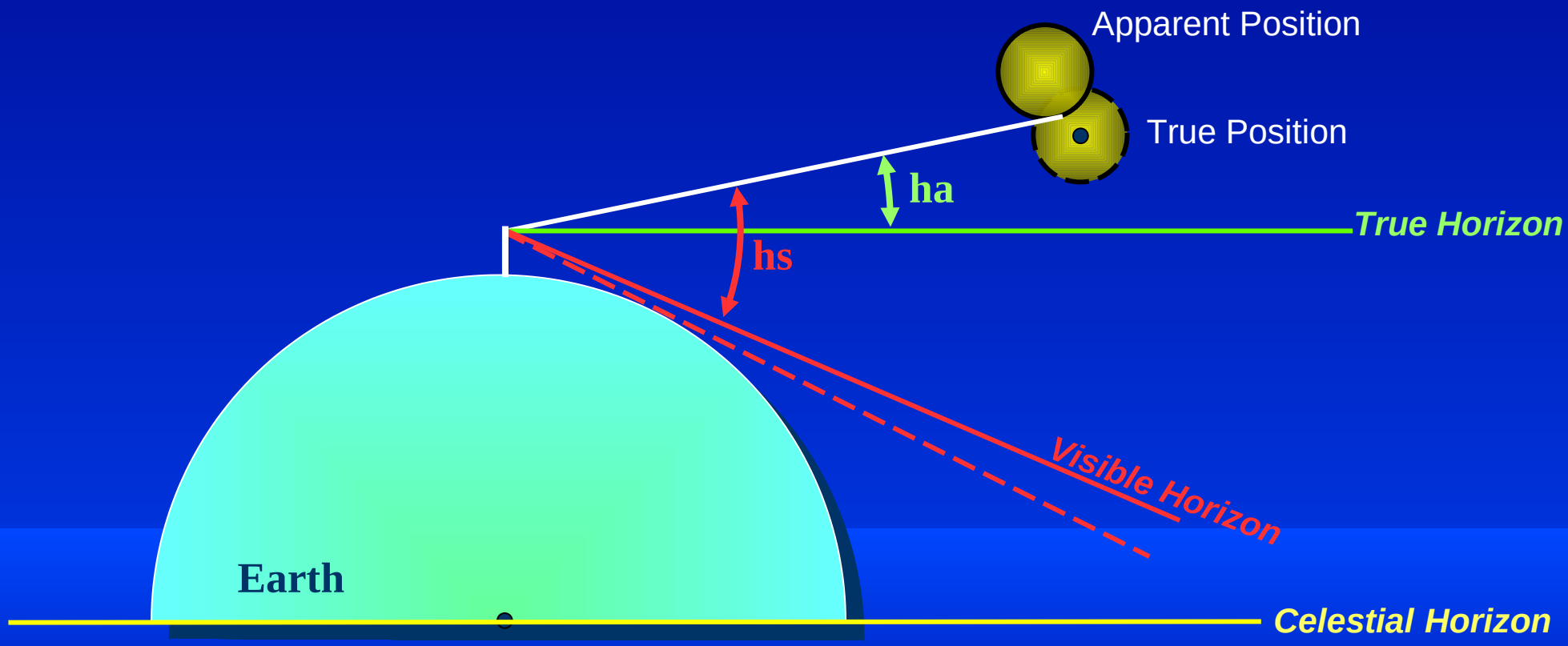
2- Relations between altitudes

Apparent altitude & sextant altitude

hs : altitude measured with sextant

ha : hs corrected for ‘IE’ and ‘dip’
used to enter Altitude Correction Tables

Ha = Hs + IC + Dip



2- Relations between altitudes

Observed altitude

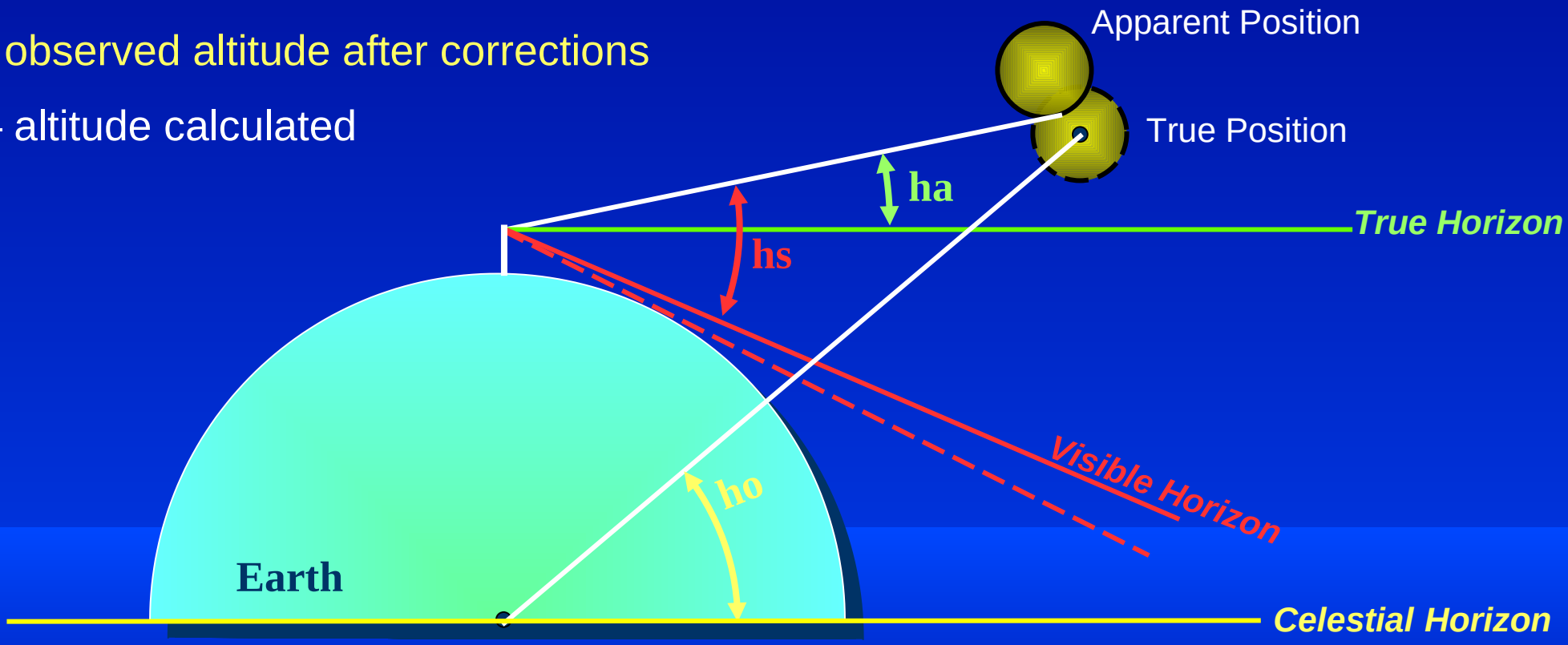
hs : altitude measured with sextant

ha : hs corrected for ‘IE’ and ‘dip’
used to enter Altitude Correction Tables

ho : observed altitude after corrections

hc – altitude calculated

ho = ha + Alt. Corr.



2- Relations between altitudes

Principle with the tables in nautical almanac

hs

Heigh of Eyes

DIP

Ht. of Eye	Corrⁿ	Ht. of Eye	Ht. of Eye	Corrⁿ
m	′	ft.	m	′
2·4	−2·8	8·0	1·0 – 1·8	
2·6	−2·9	8·6	1·5 – 2·2	
2·8	−3·0	9·2	2·0 – 2·5	
3·0	−3·1	9·8	2·5 – 2·8	
3·2	−3·2	10·5	3·0 – 3·0	
3·4	−3·3	11·2	See table ←	
3·6	−3·4	11·9		
3·8	−3·5	12·6	m	′
4·0	−3·6	13·3	20 – 7·9	
4·3	−3·7	14·1	22 – 8·3	
4·5	−3·8	14·9	24 – 8·6	
4·7	−3·9	15·7	26 – 9·0	
5·0	−4·0	16·5	28 – 9·3	
5·2	−4·1	17·4		
5·5	−4·2	18·3	30 – 9·6	
5·8	−4·3	19·1	32 – 10·0	
6·1	−4·4	20·1	34 – 10·3	
6·3	−4·5	21·0	36 – 10·6	
6·6	−4·6	22·0	38 – 10·8	
6·9	−4·7	22·9		
7·2	−4·8	23·9	40 – 11·1	
7·5	−4·9	24·9	42 – 11·4	
7·9	−5·0	26·0	44 – 11·7	
8·2	−5·1	27·1	46 – 11·9	
8·5	−5·2	28·1	48 – 12·2	
8·8		29·2		

ha

SUN

App. Alt.	OCT.—MAR. Lower Limb	OCT.—MAR. Upper Limb	App. Alt.	APR.—SEPT. Lower Limb	APR.—SEPT. Upper Limb
° ′	′	′	° ′	′	′
9 33	+10·8	−21·5	9 39	+10·6	−21·
9 45	+10·9	−21·4	9 50	+10·7	−21·1
9 56	+11·0	−21·3	10 02	+10·8	−21·0
10 08	+11·1	−21·2	10 14	+10·9	−20·9
10 20	+11·2	−21·1	10 27	+11·0	−20·8
10 33	+11·3	−21·0	10 40	+11·1	−20·7
10 46	+11·4	−20·9	10 53	+11·2	−20·6
11 00	+11·5	−20·8	11 07	+11·3	−20·5
11 15	+11·6	−20·7	11 22	+11·4	−20·4
11 30	+11·7	−20·6	11 37	+11·5	−20·3
11 45	+11·8	−20·5	11 53	+11·6	−20·2
12 01	+11·9	−20·4	12 10	+11·7	−20·1
12 18	+12·0	−20·3	12 27	+11·8	−20·0
12 36	+12·1	−20·2	12 45	+11·9	−19·9
12 54	+12·2	−20·1	13 04	+12·0	−19·8
13 14	+12·3	−20·0	13 24	+12·1	−19·7
13 34	+12·4	−19·9	13 44	+12·2	−19·6
13 55	+12·5	−19·8	14 06	+12·3	−19·5
14 17	+12·6	−19·7	14 29	+12·4	−19·4
14 41	+12·7	−19·6	14 53	+12·5	−19·3
15 05	+12·8	−19·5	15 18	+12·6	−19·2
15 31	+12·9	−19·4	15 45	+12·7	−19·1
15 59	+13·0	−19·3	16 13	+12·8	−19·0
16 27	+13·1	−19·2	16 43	+12·9	−18·9
16 58	+13·2	−19·1	17 14	+13·0	−18·8
17 30			17 47		

ho

Ha = Hs + IC+DIP

Ho = Ha + Alt. Corr.

1- Factors affecting the altitude

2- Relation between altitude

3- Nautical almanac & altitude correction

- 3 -
Nautical Almanac altitude correction

3- Nautical Almanac

Dip correction table

DIP

Ht. of Eye	Corrⁿ	Ht. of Eye	Ht. of Eye	Corrⁿ
m	′	ft.	m	′
2·4	−2·8	8·0	1·0	− 1·8
2·6	−2·9	8·6	1·5	− 2·2
2·8	−3·0	9·2	2·0	− 2·5
3·0	−3·1	9·8	2·5	− 2·8
3·2	−3·2	10·5	3·0	− 3·0
3·4	−3·3	11·2	See table ←	
3·6	−3·4	11·9		
3·8	−3·5	12·6		
4·0	−3·6	13·3	m	′
4·3	−3·7	14·1	20	− 7·9
4·5	−3·8	14·9	22	− 8·3
4·7	−3·9	15·7	24	− 8·6
5·0	−4·0	16·5	26	− 9·0
5·2	−4·1	17·4	28	− 9·3
5·5	−4·2	18·3	30	− 9·6
5·8	−4·3	19·1	32	− 10·0
6·1	−4·4	20·1	34	− 10·3
6·3	−4·5	21·0	36	− 10·6
6·6	−4·6	22·0	38	− 10·8
6·9	−4·7	22·9	40	− 11·1
7·2	−4·8	23·9	42	− 11·4
7·5	−4·9	24·9	44	− 11·7
7·9	−5·0	26·0	46	− 11·9
8·2	−5·1	27·1	48	− 12·2
8·5	−5·2	28·1		
8·8		29·2		

Ha = Hs + IC + Dip

- "Dip Table"
  - DO NOT require interpolation
- Extreme right-hand column of "Dip Table" correction (less than 8ft or greater than 70ft)
  - DOES require interpolation

3- Nautical Almanac

Dip correction table

DIP

Ht. of Eye	Corrⁿ	Ht. of Eye	Ht. of Eye	Corrⁿ
m	′	ft.	m	′
2·4	−2·8	8·0	1·0	− 1·8
2·6	−2·9	8·6	1·5	− 2·2
2·8	−3·0	9·2	2·0	− 2·5
3·0	−3·1	9·8	2·5	− 2·8
3·2	−3·2	10·5	3·0	− 3·0
3·4	−3·3	11·2	See table ←	
3·6	−3·4	11·9		
3·8	−3·5	12·6		
4·0	−3·6	13·3	m	′
4·3	−3·7	14·1	20	− 7·9
4·5	−3·8	14·9	22	− 8·3
4·7	−3·9	15·7	24	− 8·6
5·0	−4·0	16·5	26	− 9·0
5·2	−4·1	17·4	28	− 9·3
5·5	−4·2	18·3	30	− 9·6
5·8	−4·3	19·1	32	− 10·0
6·1	−4·4	20·1	34	− 10·3
6·3	−4·5	21·0	36	− 10·6
6·6	−4·6	22·0	38	− 10·8
6·9	−4·7	22·9	40	− 11·1
7·2	−4·8	23·9	42	− 11·4
7·5	−4·9	24·9	44	− 11·7
7·9	−5·0	26·0	46	− 11·9
8·2	−5·1	27·1	48	− 12·2
8·5	−5·2	28·1		
8·8		29·2		

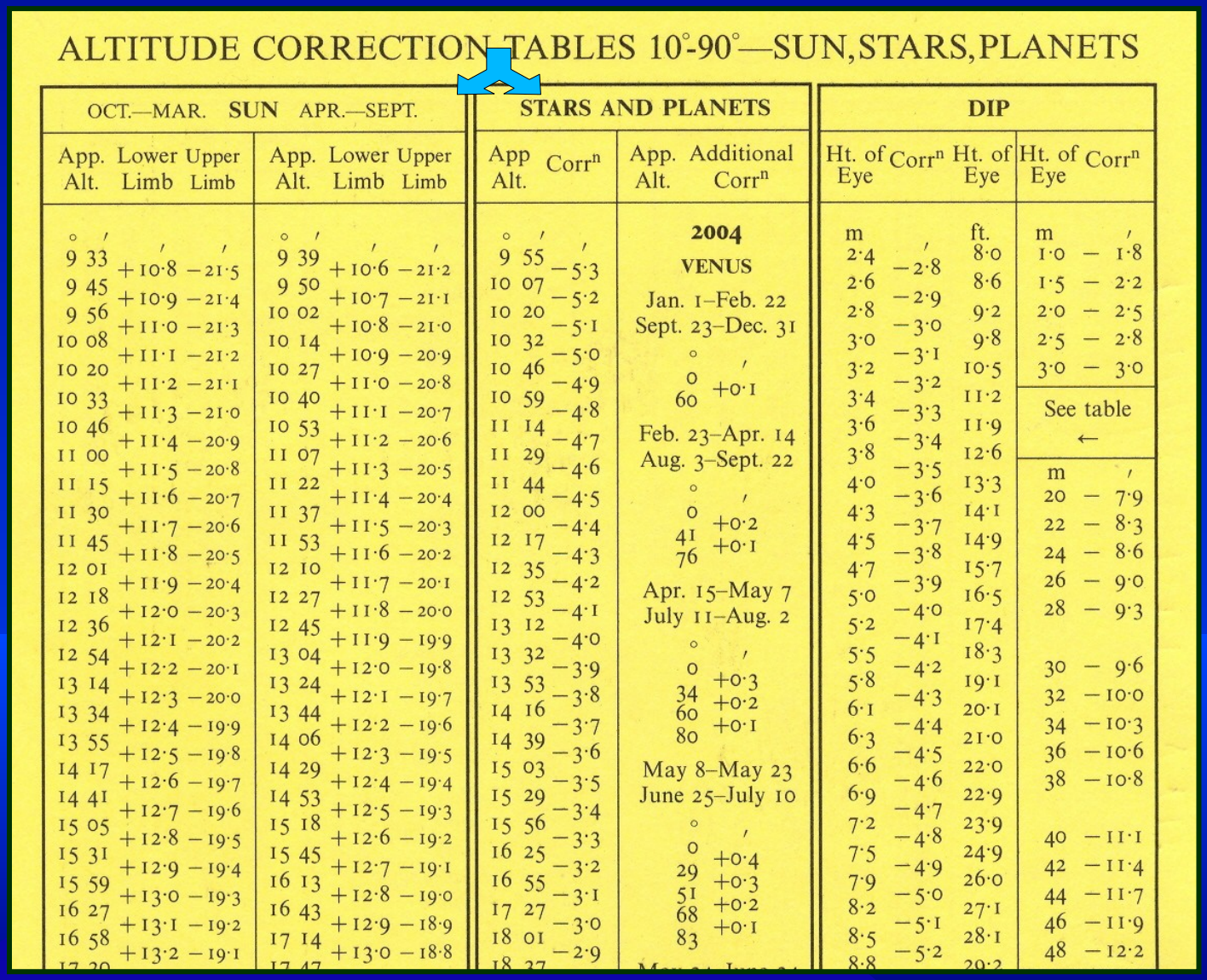
Ha = Hs + IC + Dip

- "Dip Table"
  - DO NOT require interpolation
- Extreme right-hand column of "Dip Table" correction (less than 8ft or greater than 70ft)
  - DOES require interpolation

3- Nautical Almanac

Altitude correction table- sun, stars & planets

The Altitude Correction Tables the combined correction for refraction, semi-diameter and parallax under standard atmosphere conditions,



ALTITUDE CORRECTION TABLES 10°-90°—SUN, STARS, PLANETS

SUN OCT.—MAR. App. Alt.	Lower Limb	Upper Limb	SUN APR.—SEPT. App. Alt.	Lower Limb	Upper Limb
° ′	′	′	° ′	′	′
9 33	+10·8	−21·5	9 39	+10·6	−21·2
9 45	+10·9	−21·4	9 50	+10·7	−21·1
9 56	+11·0	−21·3	10 02	+10·8	−21·0
10 08	+11·1	−21·2	10 14	+10·9	−20·9
10 20	+11·2	−21·1	10 27	+11·0	−20·8
10 33	+11·3	−21·0	10 40	+11·1	−20·7
10 46	+11·4	−20·9	10 53	+11·2	−20·6
11 00	+11·5	−20·8	11 07	+11·3	−20·5
11 15	+11·6	−20·7	11 22	+11·4	−20·4
11 30	+11·7	−20·6	11 37	+11·5	−20·3
11 45	+11·8	−20·5	11 53	+11·6	−20·2
12 01	+11·9	−20·4	12 10	+11·7	−20·1
12 18	+12·0	−20·3	12 27	+11·8	−20·0
12 36	+12·1	−20·2	12 45	+11·9	−19·9
12 54	+12·2	−20·1	13 04	+12·0	−19·8
13 14	+12·3	−20·0	13 24	+12·1	−19·7
13 34	+12·4	−19·9	13 44	+12·2	−19·6
13 55	+12·5	−19·8	14 06	+12·3	−19·5
14 17	+12·6	−19·7	14 29	+12·4	−19·4
14 41	+12·7	−19·6	14 53	+12·5	−19·3
15 05	+12·8	−19·5	15 18	+12·6	−19·2
15 31	+12·9	−19·4	15 45	+12·7	−19·1
15 59	+13·0	−19·3	16 13	+12·8	−19·0
16 27	+13·1	−19·2	16 43	+12·9	−18·9
16 58	+13·2	−19·1	17 14	+13·0	−18·8
17 30			17 47		

STARS AND PLANETS App. Alt.	Corrⁿ	App. Alt.	Additional Corrⁿ
° ′	′		
9 55	−5·3	2004	
10 07	−5·2	VENUS	
10 20	−5·1	Jan. 1–Feb. 22	
10 32	−5·0	Sept. 23–Dec. 31	
10 46	−4·9	°	′
10 59	−4·8	0	+0·1
11 14	−4·7	60	
11 29	−4·6	Feb. 23–Apr. 14	
11 44	−4·5	Aug. 3–Sept. 22	
12 00	−4·4	°	′
12 17	−4·3	0	+0·2
12 35	−4·2	41	+0·1
12 53	−4·1	76	
13 12	−4·0	Apr. 15–May 7	
13 32	−3·9	July 11–Aug. 2	
13 53	−3·8	°	′
14 16	−3·7	0	+0·3
14 39	−3·6	34	+0·2
15 03	−3·5	60	+0·1
15 29	−3·4	80	
15 56	−3·3	May 8–May 23	
16 25	−3·2	June 25–July 10	
16 55	−3·1	°	′
17 27	−3·0	0	+0·4
18 01	−2·9	29	+0·3
18 37		51	+0·2
		68	+0·1
		83	

DIP Ht. of Eye	Corrⁿ	Ht. of Eye	Ht. of Eye	Corrⁿ
m	′	ft.	m	′
2·4	−2·8	8·0	1·0	− 1·8
2·6	−2·9	8·6	1·5	− 2·2
2·8	−3·0	9·2	2·0	− 2·5
3·0	−3·1	9·8	2·5	− 2·8
3·2	−3·2	10·5	3·0	− 3·0
3·4	−3·3	11·2	See table ←	
3·6	−3·4	11·9		
3·8	−3·5	12·6		
4·0	−3·6	13·3	m	′
4·3	−3·7	14·1	20	− 7·9
4·5	−3·8	14·9	22	− 8·3
4·7	−3·9	15·7	24	− 8·6
5·0	−4·0	16·5	26	− 9·0
5·2	−4·1	17·4	28	− 9·3
5·5	−4·2	18·3	30	− 9·6
5·8	−4·3	19·1	32	−10·0
6·1	−4·4	20·1	34	−10·3
6·3	−4·5	21·0	36	−10·6
6·6	−4·6	22·0	38	−10·8
6·9	−4·7	22·9	40	−11·1
7·2	−4·8	23·9	42	−11·4
7·5	−4·9	24·9	44	−11·7
7·9	−5·0	26·0	46	−11·9
8·2	−5·1	27·1	48	−12·2
8·5	−5·2	28·1		
8·8		29·2		

For the sun

The correction is a combination of refraction, semi-diameter and parallax

For stars and planets

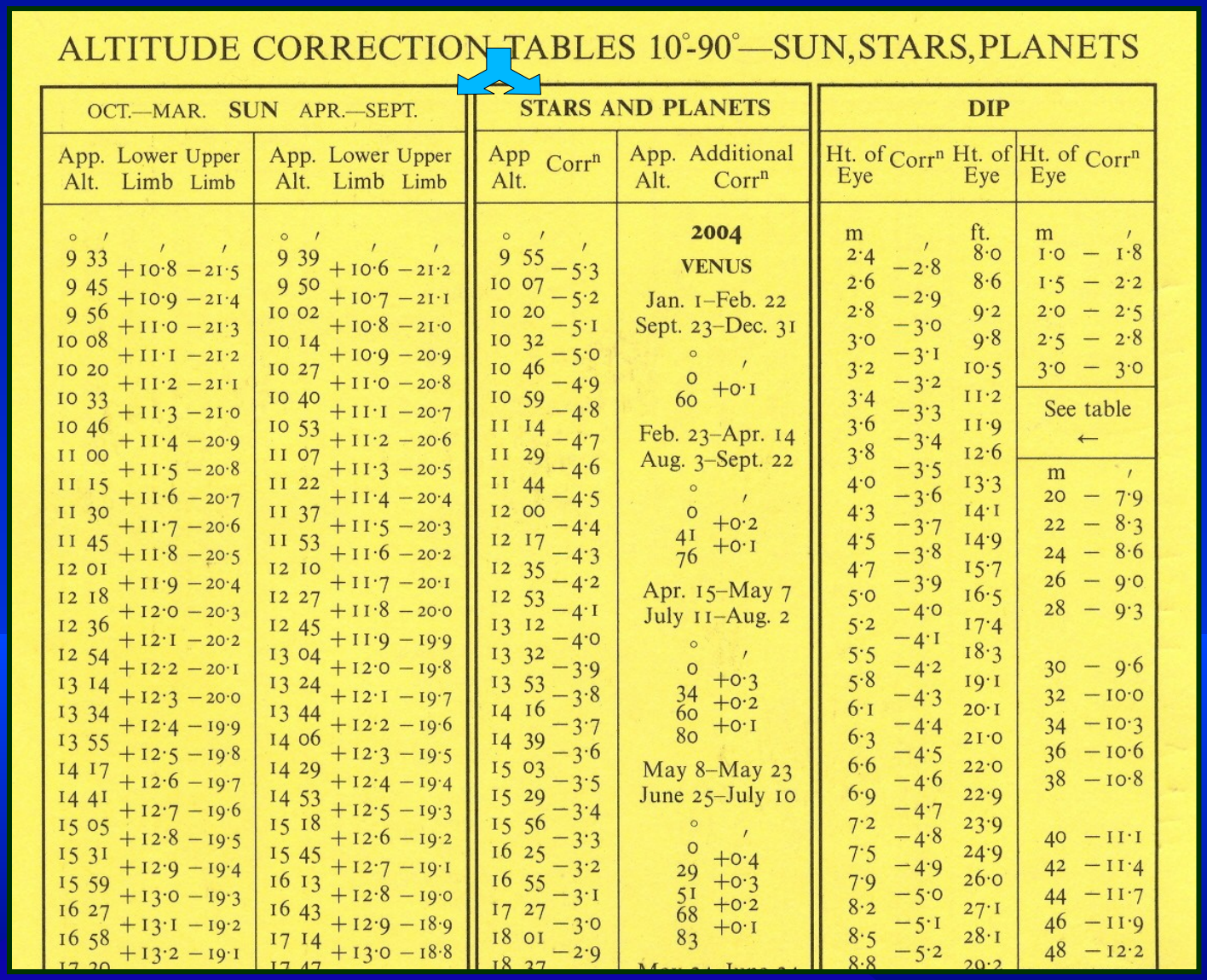
The correction is the refraction correction,

and a depending on the date, additional corrections might be required for Venus and Mars for parallax and phase.

3- Nautical Almanac

Altitude correction table- sun, stars & planets

The Altitude Correction Tables the combined correction for refraction, semi-diameter and parallax under standard atmosphere conditions,



ALTITUDE CORRECTION TABLES 10°-90°—SUN, STARS, PLANETS

SUN OCT.—MAR. App. Alt.	Lower Limb	Upper Limb	SUN APR.—SEPT. App. Alt.	Lower Limb	Upper Limb
° ′	′	′	° ′	′	′
9 33	+10·8	−21·5	9 39	+10·6	−21·2
9 45	+10·9	−21·4	9 50	+10·7	−21·1
9 56	+11·0	−21·3	10 02	+10·8	−21·0
10 08	+11·1	−21·2	10 14	+10·9	−20·9
10 20	+11·2	−21·1	10 27	+11·0	−20·8
10 33	+11·3	−21·0	10 40	+11·1	−20·7
10 46	+11·4	−20·9	10 53	+11·2	−20·6
11 00	+11·5	−20·8	11 07	+11·3	−20·5
11 15	+11·6	−20·7	11 22	+11·4	−20·4
11 30	+11·7	−20·6	11 37	+11·5	−20·3
11 45	+11·8	−20·5	11 53	+11·6	−20·2
12 01	+11·9	−20·4	12 10	+11·7	−20·1
12 18	+12·0	−20·3	12 27	+11·8	−20·0
12 36	+12·1	−20·2	12 45	+11·9	−19·9
12 54	+12·2	−20·1	13 04	+12·0	−19·8
13 14	+12·3	−20·0	13 24	+12·1	−19·7
13 34	+12·4	−19·9	13 44	+12·2	−19·6
13 55	+12·5	−19·8	14 06	+12·3	−19·5
14 17	+12·6	−19·7	14 29	+12·4	−19·4
14 41	+12·7	−19·6	14 53	+12·5	−19·3
15 05	+12·8	−19·5	15 18	+12·6	−19·2
15 31	+12·9	−19·4	15 45	+12·7	−19·1
15 59	+13·0	−19·3	16 13	+12·8	−19·0
16 27	+13·1	−19·2	16 43	+12·9	−18·9
16 58	+13·2	−19·1	17 14	+13·0	−18·8
17 30			17 47		

STARS AND PLANETS App. Alt.	Corrⁿ
° ′	′
9 55	−5·3
10 07	−5·2
10 20	−5·1
10 32	−5·0
10 46	−4·9
10 59	−4·8
11 14	−4·7
11 29	−4·6
11 44	−4·5
12 00	−4·4
12 17	−4·3
12 35	−4·2
12 53	−4·1
13 12	−4·0
13 32	−3·9
13 53	−3·8
14 16	−3·7
14 39	−3·6
15 03	−3·5
15 29	−3·4
15 56	−3·3
16 25	−3·2
16 55	−3·1
17 27	−3·0
18 01	−2·9
18 37	

STARS AND PLANETS App. Alt.	Additional Corrⁿ
	2004
	VENUS
	Jan. 1–Feb. 22
	Sept. 23–Dec. 31
°	′
0	+0·1
60	
	Feb. 23–Apr. 14
	Aug. 3–Sept. 22
°	′
0	+0·2
41	+0·1
76	
	Apr. 15–May 7
	July 11–Aug. 2
°	′
0	+0·3
34	+0·2
60	+0·1
80	
	May 8–May 23
	June 25–July 10
°	′
0	+0·4
29	+0·3
51	+0·2
68	+0·1
83	

DIP Ht. of Eye	Corrⁿ	Ht. of Eye
m	′	ft.
2·4	−2·8	8·0
2·6	−2·9	8·6
2·8	−3·0	9·2
3·0	−3·1	9·8
3·2	−3·2	10·5
3·4	−3·3	11·2
3·6	−3·4	11·9
3·8	−3·5	12·6
4·0	−3·6	13·3
4·3	−3·7	14·1
4·5	−3·8	14·9
4·7	−3·9	15·7
5·0	−4·0	16·5
5·2	−4·1	17·4
5·5	−4·2	18·3
5·8	−4·3	19·1
6·1	−4·4	20·1
6·3	−4·5	21·0
6·6	−4·6	22·0
6·9	−4·7	22·9
7·2	−4·8	23·9
7·5	−4·9	24·9
7·9	−5·0	26·0
8·2	−5·1	27·1
8·5	−5·2	28·1
8·8		29·2

Ht. of Eye	Corrⁿ
m	′
1·0	− 1·8
1·5	− 2·2
2·0	− 2·5
2·5	− 2·8
3·0	− 3·0
See table ←	
m	′
20	− 7·9
22	− 8·3
24	− 8·6
26	− 9·0
28	− 9·3
30	− 9·6
32	−10·0
34	−10·3
36	−10·6
38	−10·8
40	−11·1
42	−11·4
44	−11·7
46	−11·9
48	−12·2

For the sun

The correction is a combination of refraction, semi-diameter and parallax

For stars and planets

The correction is the refraction correction,

and a depending on the date,

additional corrections might be required for Venus and Mars for parallax and phase.

3- Nautical Almanac & altitude correction

Altitude correction table- moon

ALTITUDE CORRECTION TABLES 0°

App. Alt.	0°–4° Corrⁿ	5°–9° Corrⁿ	10°–14° Corrⁿ	15°–19° Corrⁿ	20°–24° Corrⁿ	25°–29° Corrⁿ	30°–34° Corrⁿ	App. Alt.
′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	′
00	0 34·5	5 58·2	10 62·1	15 62·8	20 62·2	25 60·8	30 58·9	00
10	36·5	58·5	62·2	62·8	62·2	60·8	58·8	10
20	38·3	58·7	62·2	62·8	62·1	60·7	58·8	20
30	40·0	58·9	62·3	62·8	62·1	60·7	58·7	30
40	41·5	59·1	62·3	62·8	62·0	60·6	58·6	40
50	42·9	59·3	62·4	62·7	62·0	60·6	58·5	50
00	1 44·2	6 59·5	11 62·4	16 62·7	21 62·0	26 60·5	31 58·5	00
10	45·4	59·7	62·4	62·7	61·9	60·4	58·4	10
20	46·5	59·9	62·5	62·7	61·9	60·4	58·3	20
30	47·5	60·0	62·5	62·7	61·9	60·3	58·2	30
40	48·4	60·2	62·5	62·7	61·8	60·3	58·2	40
50	49·3	60·3	62·6	62·7	61·8	60·2	58·1	50
00	2 50·1	7 60·5	12 62·6	17 62·7	22 61·7	27 60·1	32 58·0	00
10	50·8	60·6	62·6	62·6	61·7	60·1	57·9	10
20	51·5	60·7	62·6	62·6	61·6	60·0	57·8	20
30	52·2	60·9	62·7	62·6	61·6	59·9	57·8	30
40	52·8	61·0	62·7	62·6	61·6	59·9	57·7	40
50	53·4	61·1	62·7	62·6	61·5	59·8	57·6	50
00	3 53·9	8 61·2	13 62·7	18 62·5	23 61·5	28 59·7	33 57·5	00
10	54·4	61·3	62·7	62·5	61·4	59·7	57·4	10
20	54·9	61·4	62·7	62·5	61·4	59·6	57·4	20
30	55·3	61·5	62·8	62·5	61·3	59·5	57·3	30
40	55·7	61·6	62·8	62·4	61·3	59·5	57·2	40
50	56·1	61·6	62·8	62·4	61·2	59·4	57·1	50
00	4 56·4	9 61·7	14 62·8	19 62·4	24 61·2	29 59·3	34 57·0	00
10	56·8	61·8	62·8	62·4	61·1	59·3	56·9	10
20	57·1	61·9	62·8	62·3	61·1	59·2	56·9	20
30	57·4	61·9	62·8	62·3	61·0	59·1	56·8	30
40	57·7	62·0	62·8	62·3	61·0	59·1	56·7	40
50	58·0	62·1	62·8	62·2	60·9	59·0	56·6	50

HP	L	U	L	U	L	U	L	U	L	U	L	U	L	U	HP
′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′
54·0	0·3	0·9	0·3	0·9	0·4	1·0	0·5	1·1	0·6	1·2	0·7	1·3	0·9	1·5	54·0
54·3	0·7	1·1	0·7	1·2	0·8	1·2	0·8	1·3	0·9	1·4	1·1	1·5	1·2	1·7	54·3
54·6	1·1	1·4	1·1	1·4	1·1	1·4	1·2	1·5	1·3	1·6	1·4	1·7	1·5	1·8	54·6
54·9	1·4	1·6	1·5	1·6	1·5	1·6	1·6	1·7	1·6	1·8	1·8	1·9	1·9	2·0	54·9
55·2	1·8	1·8	1·8	1·8	1·9	1·8	1·9	1·9	2·0	2·0	2·1	2·1	2·2	2·2	55·2
55·5	2·2	2·0	2·2	2·0	2·3	2·1	2·3	2·1	2·4	2·2	2·4	2·3	2·5	2·4	55·5
55·8	2·6	2·2	2·6	2·2	2·6	2·3	2·7	2·3	2·7	2·4	2·8	2·4	2·9	2·5	55·8

For the moon The tables are divided two parts.

The first part

=> combination of **refraction**, semi-diameter and parallax for **the lower limb,**

=>so if the altitude of the moon is taken **from the upper limb, then 30´ must be subtracted**.

The second part

=> correction for variations in semi-diameter and parallax, depending on the horizontal parallax.

3- Nautical Almanac & altitude correction

Altitude correction methodology

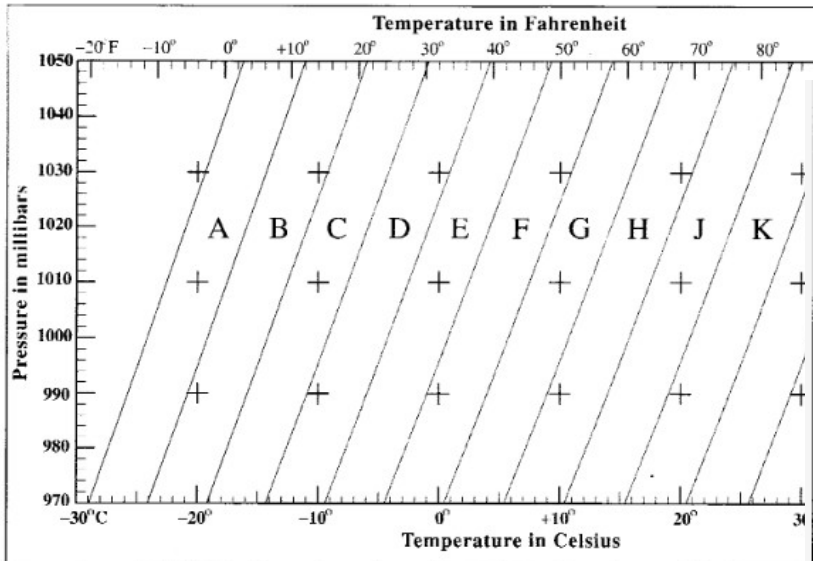
hs =	
+ IC	
+ Dip	
ha =	
+Alt. correction	
-30’ for upper limb(Moon)	
+U,L, correction for Moon	
+Additionnal correction for Venus	
+Additional refraction correction (non standard temp/pression)	
ho =	

3- Nautical Almanac & altitude correction

Altitude correction table -additional corrections

A4 ALTITUDE CORRECTION TABLES—ADDITIONAL CORRECTIONS

ADDITIONAL REFRACTION CORRECTIONS FOR NON-STANDARD CONDITIONS



App. Alt.	A	B	C	D	E	F	G	H	J	K	L	M
° ′	′	′	′	′	′	′	′	′	′	′	′	′
00 00	−7·3	−5·9	−4·6	−3·4	−2·2	−1·1	0·0	+1·0	+2·0	+3·0	+4·0	+4·9
00 30	5·5	4·5	3·5	2·6	1·7	0·8	0·0	0·8	1·6	2·3	3·1	3·8
01 00	4·4	3·5	2·8	2·0	1·3	0·7	0·0	0·6	1·2	1·8	2·4	3·0
01 30	3·5	2·9	2·2	1·7	1·1	0·5	0·0	0·5	1·0	1·5	2·0	2·5
02 00	2·9	2·4	1·9	1·4	0·9	0·4	0·0	0·4	0·8	1·3	1·7	2·0
02 30	−2·5	−2·0	−1·6	−1·2	−0·8	−0·4	0·0	+0·4	+0·7	+1·1	+1·4	+1·7
03 00	2·1	1·7	1·4	1·0	0·7	0·3	0·0	0·3	0·6	0·9	1·2	1·5
03 30	1·9	1·5	1·2	0·9	0·6	0·3	0·0	0·3	0·5	0·8	1·1	1·3
04 00	1·6	1·3	1·1	0·8	0·5	0·3	0·0	0·2	0·5	0·7	0·9	1·2
04 30	1·5	1·2	0·9	0·7	0·5	0·2	0·0	0·2	0·4	0·6	0·8	1·0
05 00	−1·3	−1·1	−0·9	−0·6	−0·4	−0·2	0·0	+0·2	+0·4	+0·6	+0·8	+0·9
06	1·1	0·9	0·7	0·5	0·3	0·2	0·0	0·2	0·3	0·5	0·6	0·8
07	1·0	0·8	0·6	0·5	0·3	0·1	0·0	0·1	0·3	0·4	0·5	0·7
08	0·8	0·7	0·5	0·4	0·3	0·1	0·0	0·1	0·2	0·4	0·5	0·6
09	0·7	0·6	0·5	0·4	0·2	0·1	0·0	0·1	0·2	0·3	0·4	0·5
10 00	−0·7	−0·5	−0·4	−0·3	−0·2	−0·1	0·0	+0·1	+0·2	+0·3	+0·4	+0·5
12	0·6	0·5	0·4	0·3	0·2	0·1	0·0	0·1	0·2	0·2	0·3	0·4
14	0·5	0·4	0·3	0·2	0·1	0·1	0·0	0·1	0·1	0·2	0·3	0·3
16	0·4	0·3	0·3	0·2	0·1	0·1	0·0	0·1	0·1	0·2	0·2	0·3
18	0·4	0·3	0·2	0·2	0·1	−0·1	0·0	+0·1	0·1	0·2	0·2	0·3
20 00	−0·3	−0·3	−0·2	−0·2	−0·1	0·0	0·0	0·0	+0·1	+0·1	+0·2	+0·2
25	0·3	0·2	0·2	0·1	0·1	0·0	0·0	0·0	0·1	0·1	0·1	0·2
30	0·2	0·2	0·1	0·1	0·1	0·0	0·0	0·0	+0·1	0·1	0·1	0·1
35	0·2	0·1	0·1	0·1	−0·1	0·0	0·0	0·0	0·0	0·1	0·1	0·1
40	0·1	0·1	0·1	−0·1	0·0	0·0	0·0	0·0	0·0	+0·1	0·1	0·1
50 00	−0·1	−0·1	−0·1	0·0	0·0	0·0	0·0	0·0	0·0	0·0	+0·1	+0·1

App. Alt.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	App. Alt.
° ′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	° ′
00 00	−7·3	−5·9	−4·6	−3·4	−2·2	−1·1	0·0	+1·0	+2·0	+3·0	+4·0	+4·9	+5·9	+6·9	00 00
00 30	5·5	4·5	3·5	2·6	1·7	0·8	0·0	0·8	1·6	2·3	3·1	3·8	4·5	5·3	00 30
01 00	4·4	3·5	2·8	2·0	1·3	0·7	0·0	0·6	1·2	1·8	2·4	3·0	3·6	4·2	01 00
01 30	3·5	2·9	2·2	1·7	1·1	0·5	0·0	0·5	1·0	1·5	2·0	2·5	2·9	3·4	01 30
02 00	2·9	2·4	1·9	1·4	0·9	0·4	0·0	0·4	0·8	1·3	1·7	2·0	2·4	2·8	02 00
02 30	−2·5	−2·0	−1·6	−1·2	−0·8	−0·4	0·0	+0·4	+0·7	+1·1	+1·4	+1·7	+2·1	+2·4	02 30
03 00	2·1	1·7	1·4	1·0	0·7	0·3	0·0	0·3	0·6	0·9	1·2	1·5	1·8	2·1	03 00
03 30	1·9	1·5	1·2	0·9	0·6	0·3	0·0	0·3	0·5	0·8	1·1	1·3	1·6	1·8	03 30
04 00	1·6	1·3	1·1	0·8	0·5	0·3	0·0	0·2	0·5	0·7	0·9	1·2	1·4	1·6	04 00
04 30	1·5	1·2	0·9	0·7	0·5	0·2	0·0	0·2	0·4	0·6	0·8	1·0	1·3	1·5	04 30
05 00	−1·3	−1·1	−0·9	−0·6	−0·4	−0·2	0·0	+0·2	+0·4	+0·6	+0·8	+0·9	+1·1	+1·3	05 00
06	1·1	0·9	0·7	0·5	0·3	0·2	0·0	0·2	0·3	0·5	0·6	0·8	0·9	1·1	06
07	1·0	0·8	0·6	0·5	0·3	0·1	0·0	0·1	0·3	0·4	0·5	0·7	0·8	0·9	07
08	0·8	0·7	0·5	0·4	0·3	0·1	0·0	0·1	0·2	0·4	0·5	0·6	0·7	0·8	08
09	0·7	0·6	0·5	0·4	0·2	0·1	0·0	0·1	0·2	0·3	0·4	0·5	0·6	0·7	09
10 00	−0·7	−0·5	−0·4	−0·3	−0·2	−0·1	0·0	+0·1	+0·2	+0·3	+0·4	+0·5	+0·6	+0·7	10 00
12	0·6	0·5	0·4	0·3	0·2	0·1	0·0	0·1	0·2	0·2	0·3	0·4	0·5	0·5	12
14	0·5	0·4	0·3	0·2	0·1	0·1	0·0	0·1	0·1	0·2	0·3	0·3	0·4	0·5	14
16	0·4	0·3	0·3	0·2	0·1	0·1	0·0	0·1	0·1	0·2	0·2	0·3	0·3	0·4	16
18	0·4	0·3	0·2	0·2	0·1	−0·1	0·0	+0·1	0·1	0·2	0·2	0·3	0·3	0·4	18
20 00	−0·3	−0·3	−0·2	−0·2	−0·1	0·0	0·0	0·0	+0·1	+0·1	+0·2	+0·2	+0·3	+0·3	20 00
25	0·3	0·2	0·2	0·1	0·1	0·0	0·0	0·0	0·1	0·1	0·1	0·2	0·2	0·2	25
30	0·2	0·2	0·1	0·1	0·1	0·0	0·0	0·0	+0·1	0·1	0·1	0·1	0·2	0·2	30
35	0·2	0·1	0·1	0·1	−0·1	0·0	0·0	0·0	0·0	0·1	0·1	0·1	0·1	0·2	35
40	0·1	0·1	0·1	−0·1	0·0	0·0	0·0	0·0	0·0	+0·1	0·1	0·1	0·1	0·1	40
50 00	−0·1	−0·1	−0·1	0·0	0·0	0·0	0·0	0·0	0·0	0·0	+0·1	+0·1	+0·1	+0·1	50 00

The graph is entered with arguments temperature and pressure to find a zone letter; using as arguments this zone letter and apparent altitude (sextant altitude corrected for index error and dip), a correction is taken from the table. This correction is to be applied to the sextant altitude in addition to the corrections for standard conditions (for the Sun, stars and planets from page A2-A3 and for the Moon from pages xxxiv and xxxv).