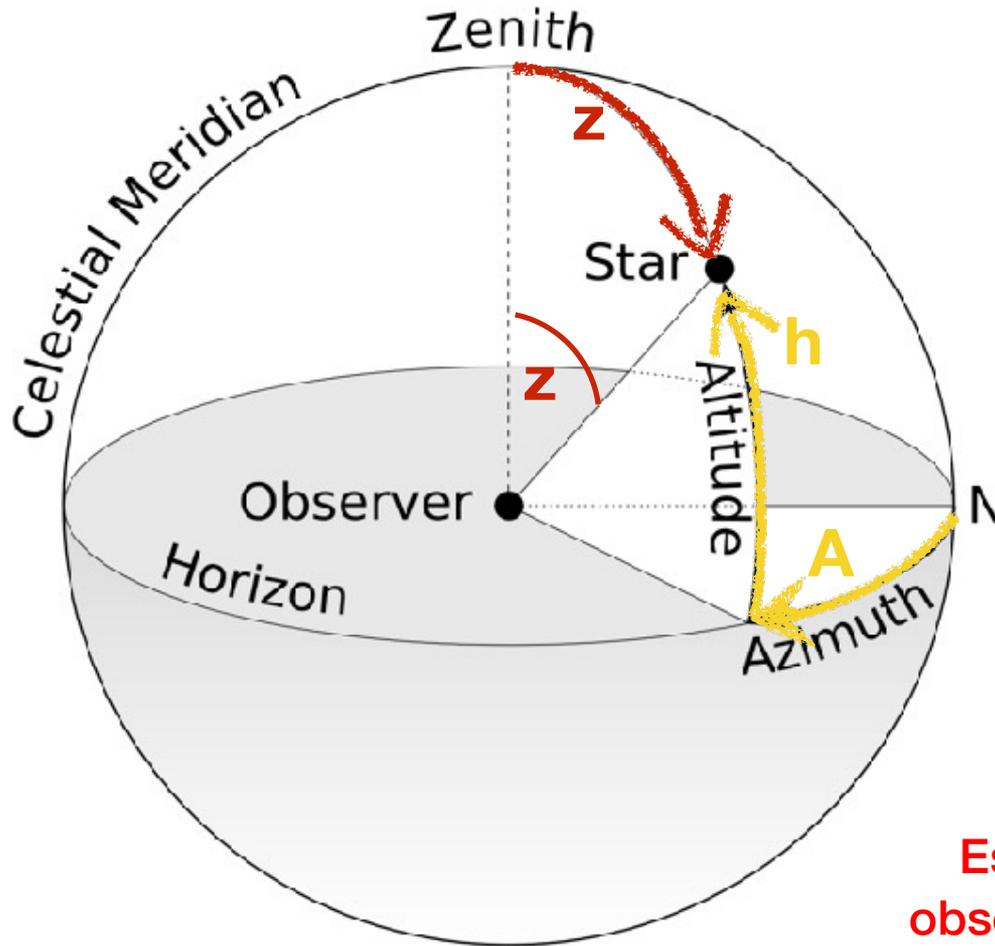


Coordenadas de importancia
para la observación

Coordenadas Alt-Azimutales:

(h,A)



Plano Fundamental: Horizonte

Punto Cero: Punto cardinal N

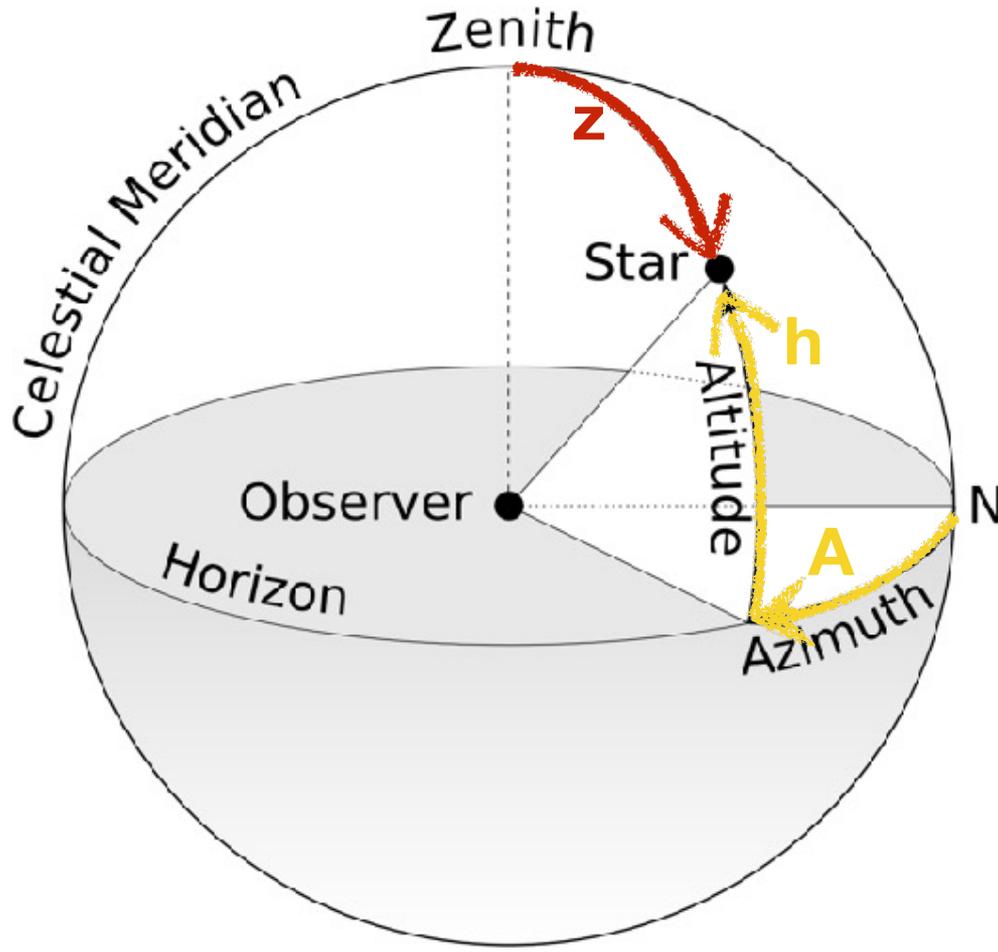
- **Altura (h):** altura (ángulo de elevación) respecto al plano del horizonte
- **Azimut (A):** medido sobre el plano del horizonte, desde el N en sentido horario (hacia el E)
- **Ángulo zenital (z):**

$$z = 90^\circ - h$$

Es un sistema relativo o solidario al observador, por lo tanto las estrellas se mueven (cambian de coordenadas) en este sistema con el tiempo

Coordenadas Alt-Azimutales:

(h,A)

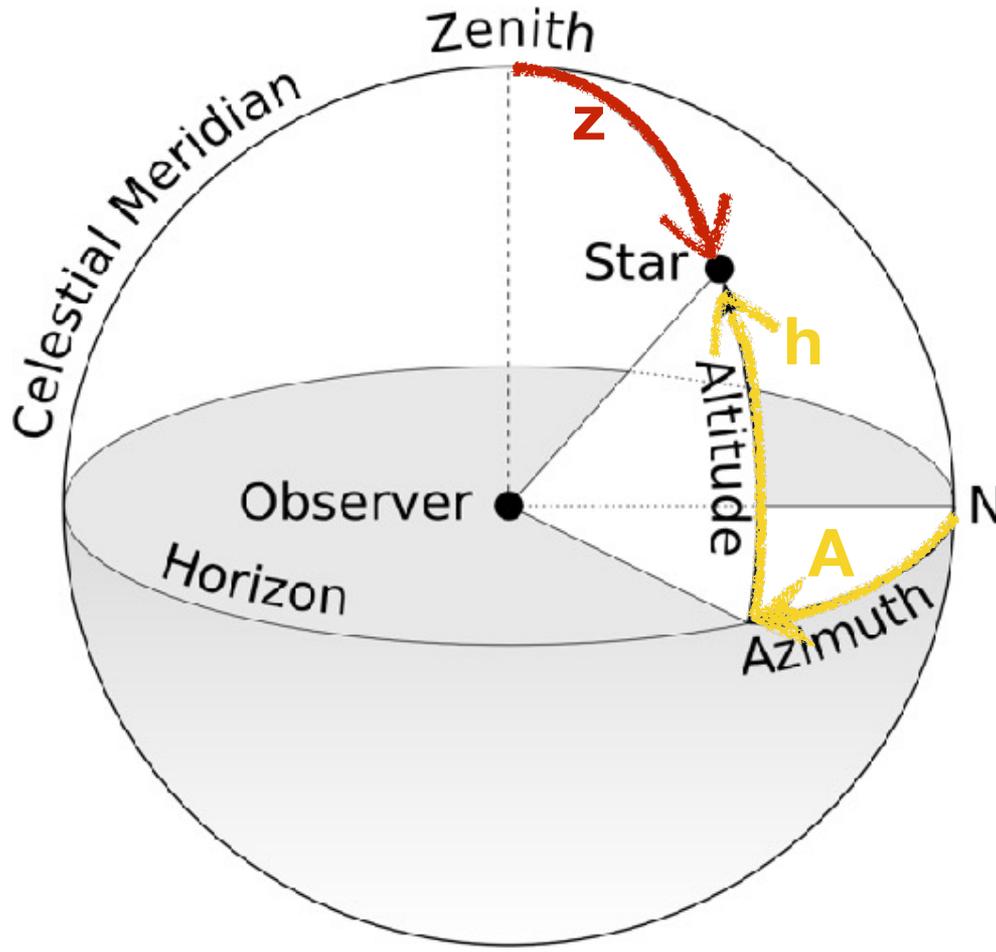


Preguntas:

- (h,A) y z de:
- Punto cardinal N:
- Punto Cardinal E:
- Zenith:
- Nadir:

Coordenadas Alt-Azimutales:

(h,A)

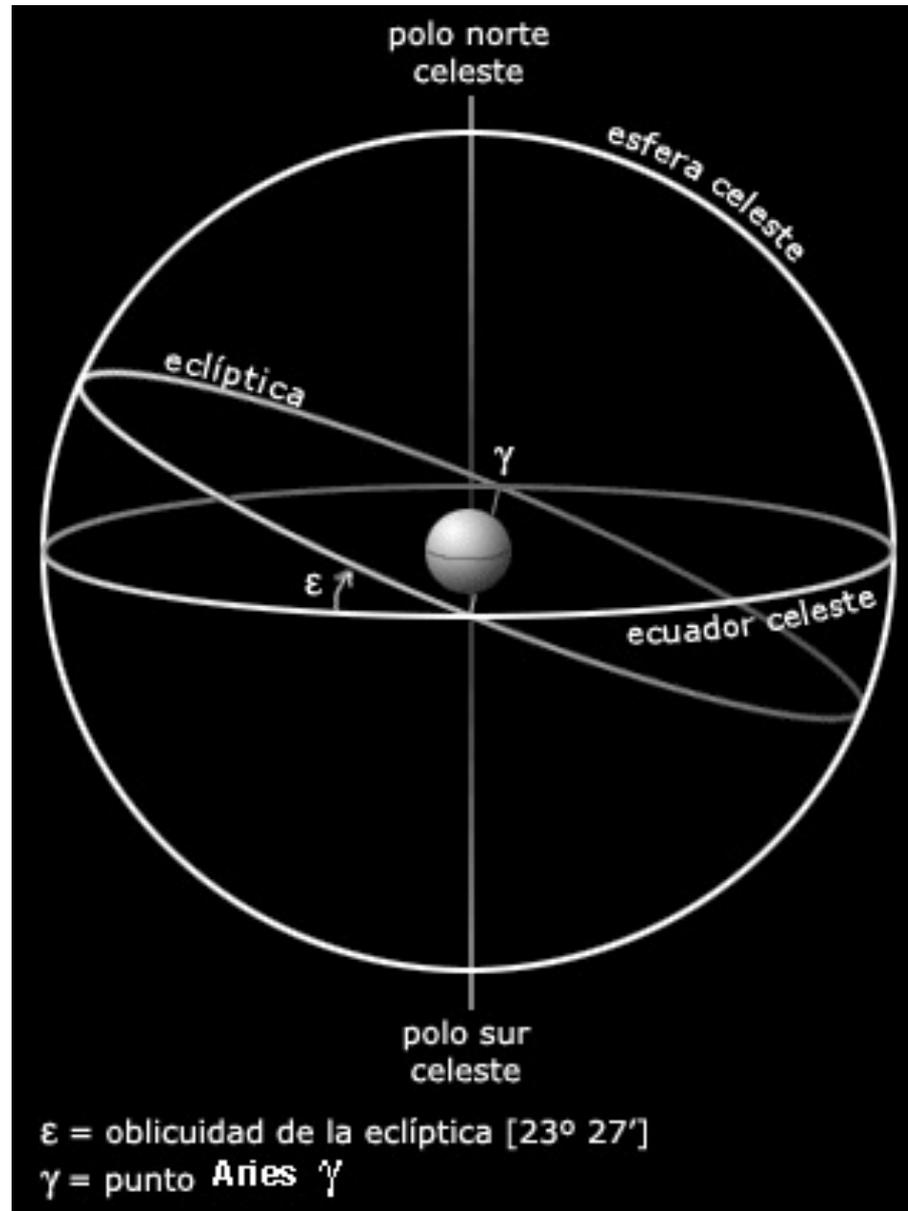


Preguntas:

- (h,A) y z de:

- Punto cardinal N:
 $(0^\circ, 0^\circ)$, $z=90^\circ$
- Punto Cardinal E:
 $(0^\circ, 90^\circ)$, $z=90^\circ$
- Zenith:
 $(90^\circ, \text{indef})$, $z=0^\circ$
- Nadir:
 $(-90^\circ, \text{indef})$, $z=180^\circ$

Ecuador y eclíptica



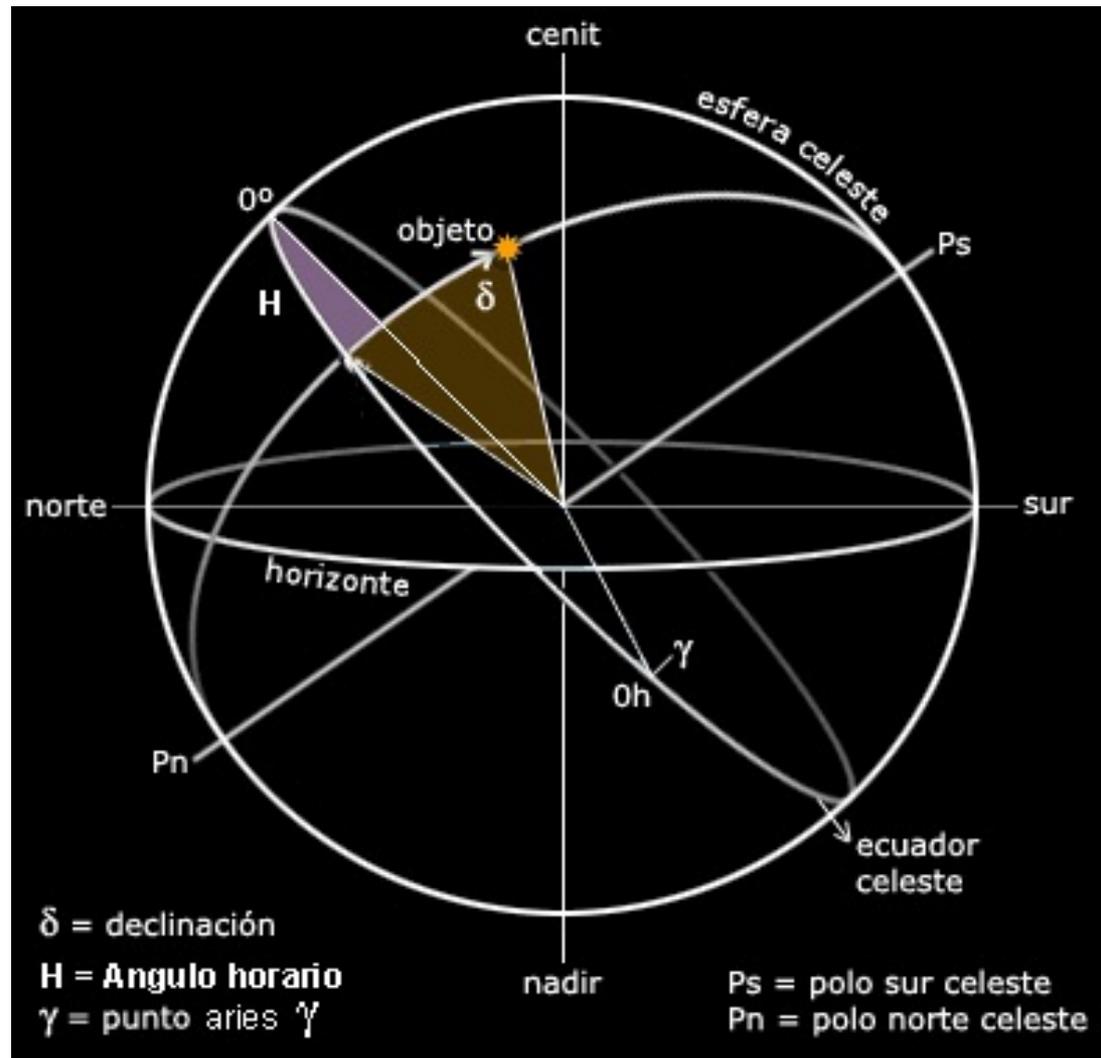
Coordenadas ecuatoriales relativas u horarias

Plano Fundamental: Ecuador Celeste
Punto Cero: Cruce del Ecuador con el Meridiano elevado

Coordenadas

- **Declinación (δ):** altura respecto al plano del Ecuador Celeste
- **Ángulo Horario (AH):** ángulo medido sobre el plano del Ecuador Celeste, desde el meridiano del observador en dirección Oeste

Es un sistema **mixto** - una coordenada es absoluta (DEC) y la otra (AH) depende del observador (y del tiempo)



Coordenadas ecuatoriales absolutas

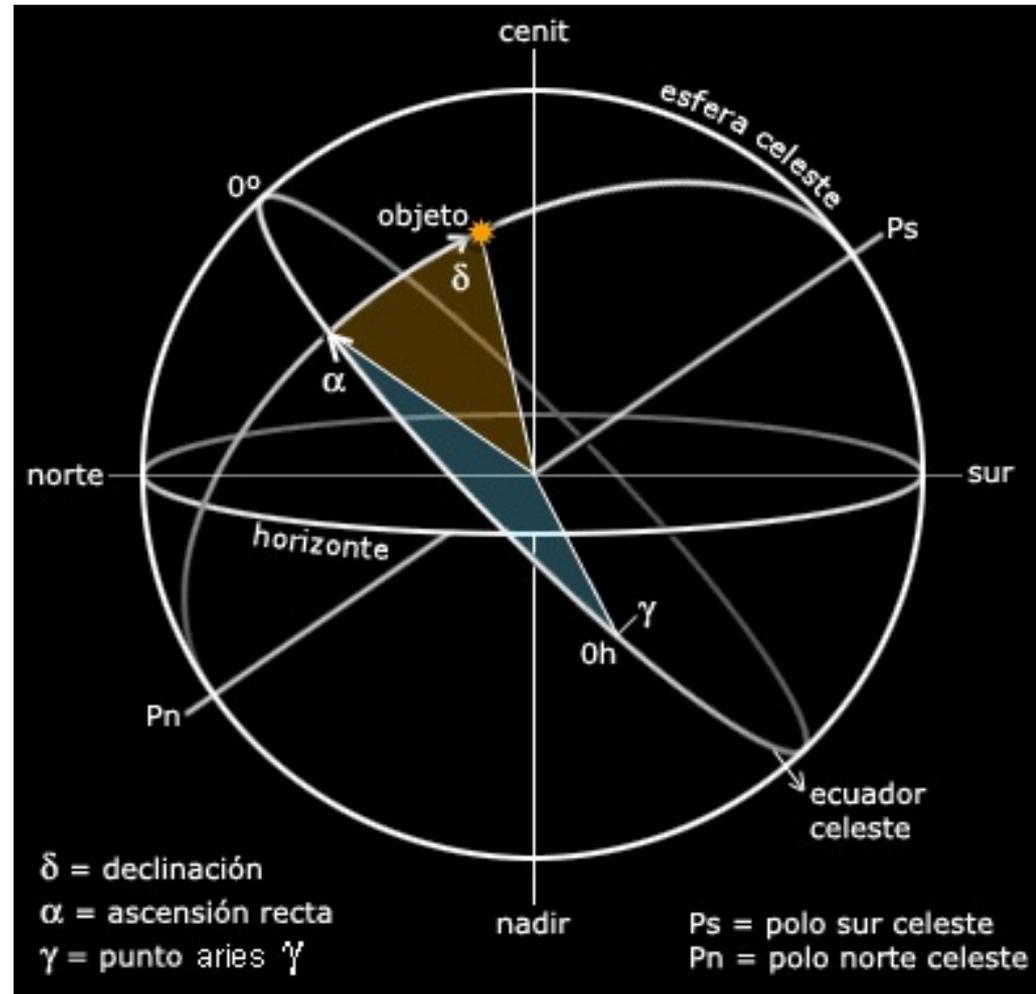
Plano Fundamental: Ecuador Celeste

Punto Cero: Punto vernal γ

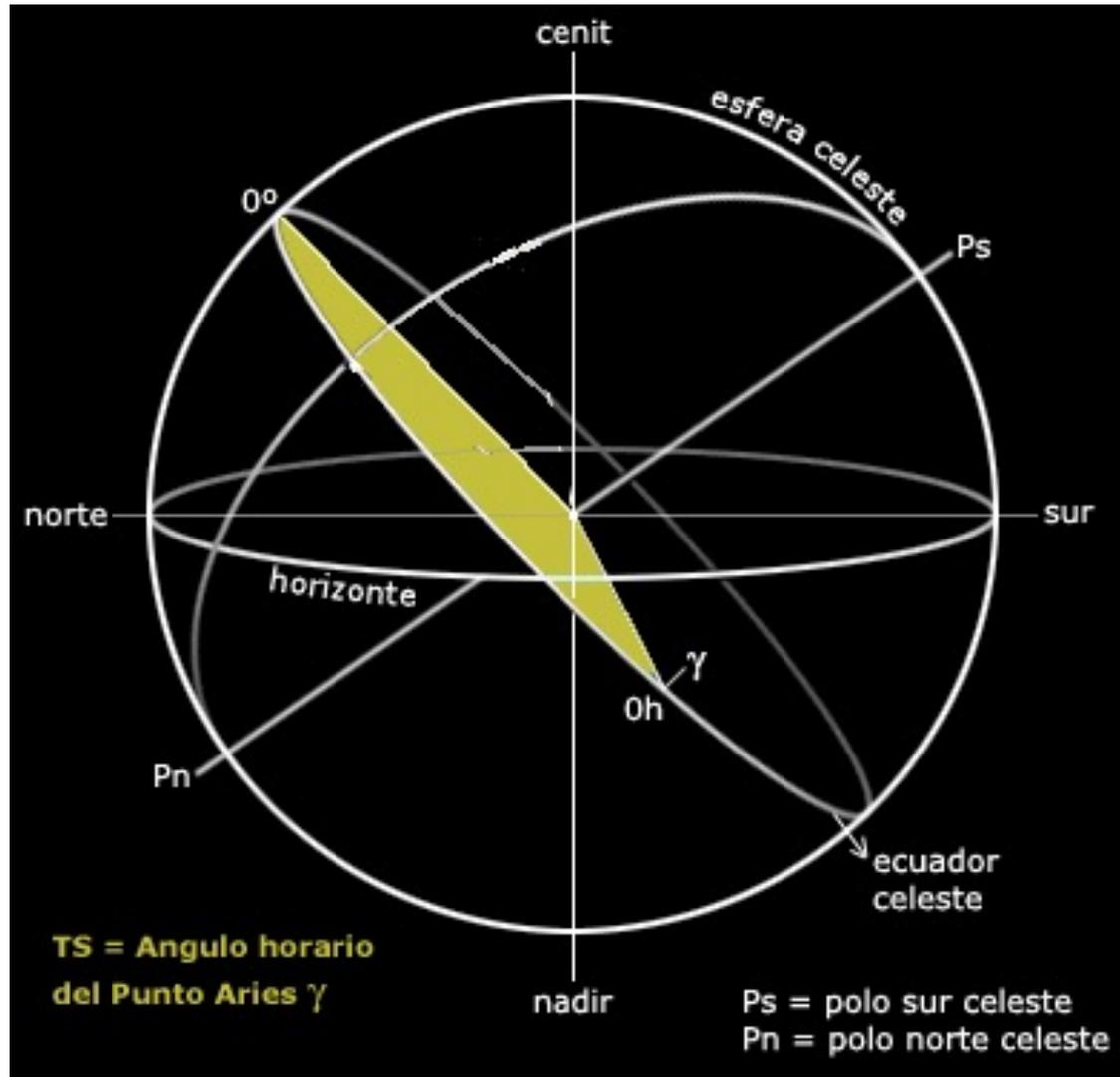
Coordenadas

- **Declinación (δ):** altura respecto al plano del Ecuador Celeste
- **Ascensión Recta (AR o α):** ángulo medido sobre el plano del Ecuador Celeste, desde el punto vernal γ

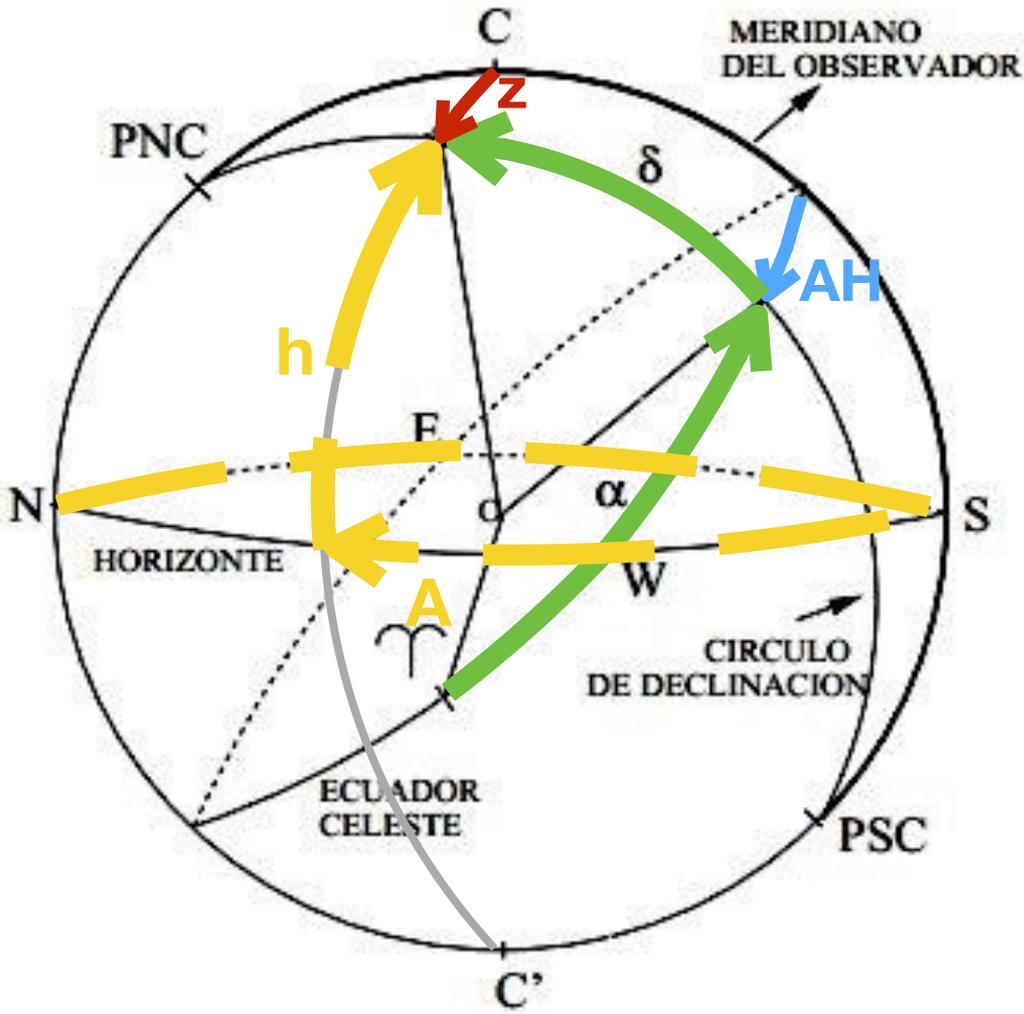
Es un sistema absoluto - la posición de un objeto celeste *no* depende del observador ni del tiempo en este sistema



Tiempo Sidéreo Local



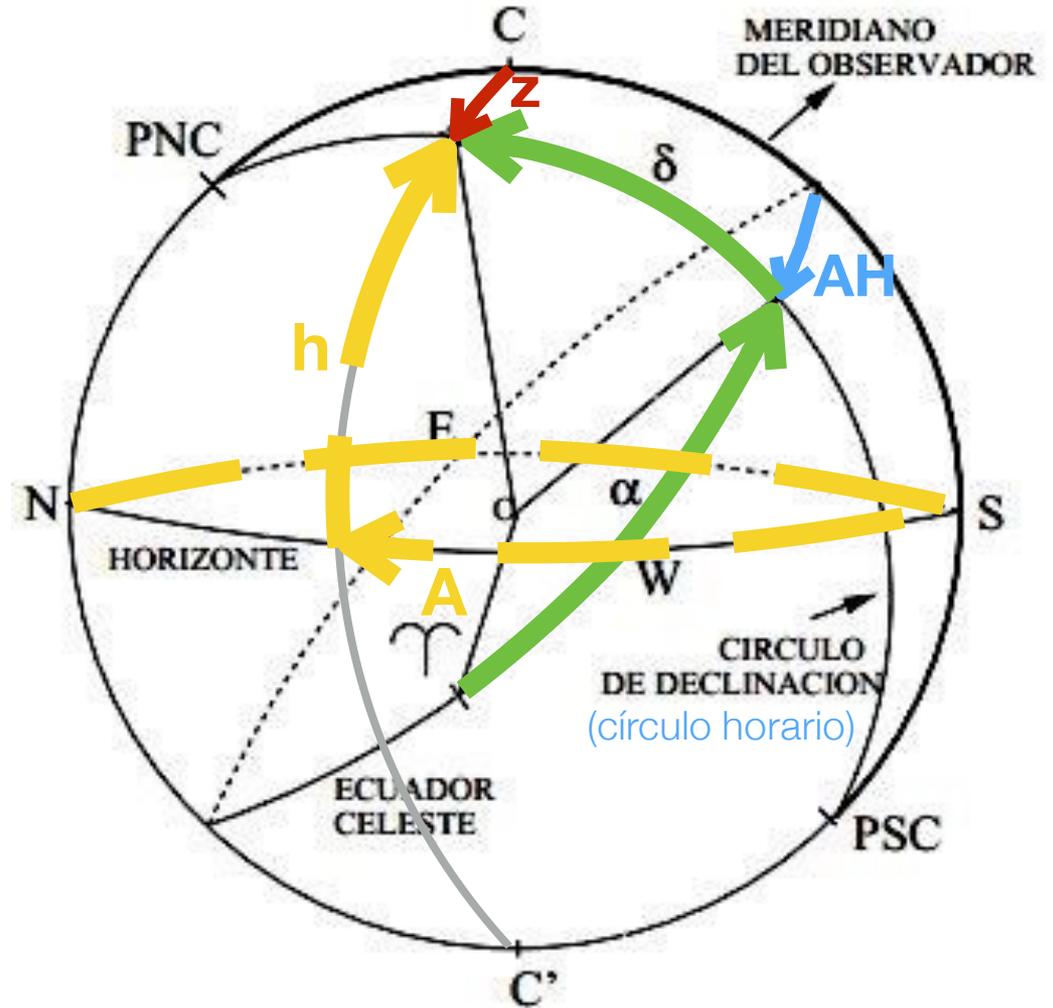
Coordenadas - Resumen



Coordenadas Ecuatoriales: (α, δ) ó (AR, DEC)

Preguntas:

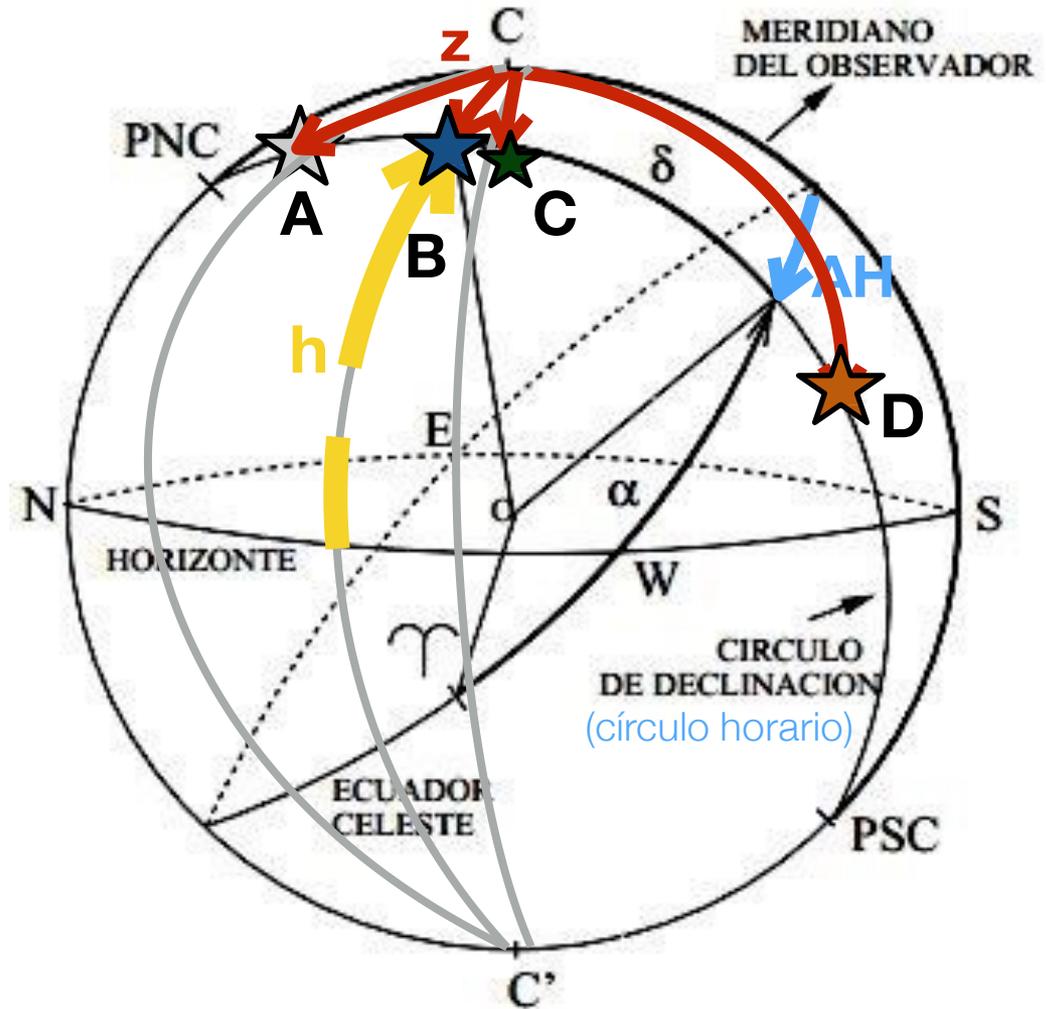
1. **AH** del Meridiano:
2. **AH** del Punto Cardinal W:
3. AH de un objeto que se está poniendo:
4. AH de un objeto que está naciendo:



Coordenadas Ecuatoriales: (α, δ) ó (AR, DEC)

Preguntas:

1. Comparar el ángulo zenital z para objetos con el mismo **AH** y diferente **DEC**
A, B, C, D
2. Para una **DEC** dada, cuál es el mínimo ángulo zenital z ?
(parte de una pregunta del práctico)



Visibilidad y culminaciones

- Astros visibles en el Hemisferio Sur

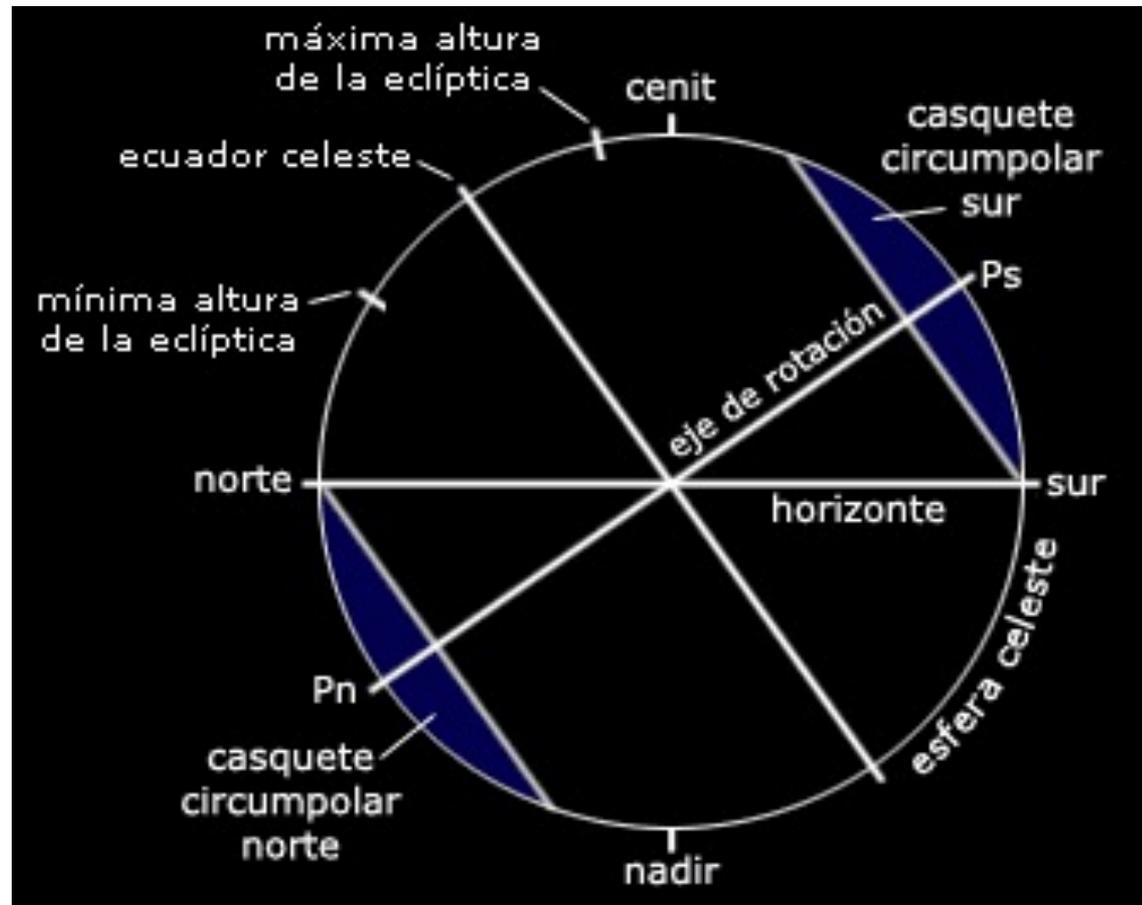
$$\delta < 90 + \varphi \quad (\varphi \text{ con su signo})$$

- Perpetuamente visibles si

$$\delta < -(90 + \varphi)$$

- Culminación para

$$TSL = \alpha$$



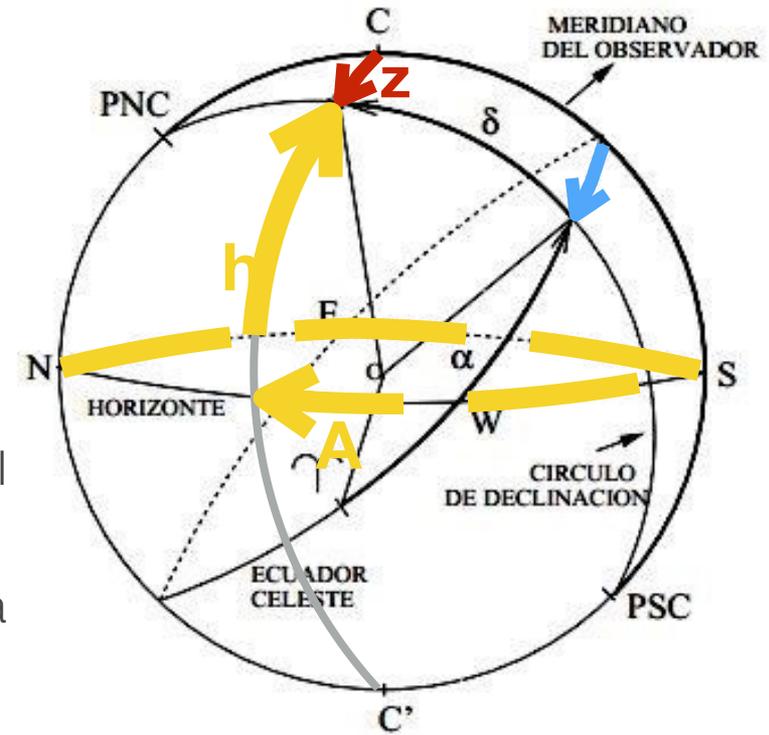
Criterios de visibilidad

- **Objeto a una altura mínima sobre el horizonte:**

- Altura $h > 30^\circ$ ($\Leftrightarrow z < 60^\circ$)

- **Condiciones óptimas:**

- Observar lo más cerca posible del paso por el meridiano ($AH=0^\circ$) \rightarrow garantiza el mínimo ángulo zenital
- Mínima iluminación de la Luna y/o máxima distancia a ésta
- Máxima cantidad de horas efectivas de observación



Dado un objeto: buscar sus coordenadas

- Sabemos qué objeto queremos observar: e.g. Nube Grande de Magallanes (LMC), cúmulo Omega Centauri (NGC 5272), asteroide Vesta, ...

The screenshot shows the SIMBAD Astronomical Database interface. At the top, there is a navigation bar with links for Portal, Simbad, VizieR, Aladin, X-Match, Other, and Help. The main heading is "SIMBAD Astronomical Database - CDS (Strasbourg)".

Under the heading "What is SIMBAD?", there are three columns of links:

- Queries**: basic search, **by identifier**, **by coordinates**, by criteria, reference query, **scripts**, **TAP queries**, options, and Display all user annotations.
- Documentation**: User's guide, Query by urls, Nomenclature Dictionary, Object types, List of journals, Measurement description, Spectral type coding, User annotations documentation, and Acknowledgment.
- Information**: Presentation, Image thumbnails, **SimWatch**, and Release: SIMBAD4 1.7 - May-2016, Release history.

Below these columns, there are two more sections:

- Content**: A text block describing the database's purpose and usage.
- Basic search**: A search form with a text input field, a "SIMBAD search" button, a "clear" button, and a "help" link. Below the form, it says "Install the Simbad basic search in your tool bar".

Two red arrows point to the "by identifier" and "by coordinates" links in the Queries column. A green dashed box highlights the Basic search section.

Visibilidad: Calculador StarAlt

The screenshot shows a web browser window with the URL `catserver.ing.iac.es`. The page header features the logo for the Isaac Newton Group of Telescopes (ING) and a navigation menu with links for "About ING", "Astronomy", "Developments", "Public Information", and a search box. The breadcrumb trail indicates the current location: `Home > Astronomy > Object Visibility`.

Object Visibility – STARALT

Staralt is a program that shows the observability of objects in various ways: either you can plot altitude against time for a particular night (**Staralt**), or plot the path of your objects across the sky for a particular night (**Startrack**), or plot how altitude changes over a year (**Starobs**), or get a table with the best observing date for each object (**Starmult**). For further information, click on the "help" button at the bottom of the page.

The main form is divided into several sections:

- Mode:** A dropdown menu set to "Staralt".
- Night:** A date selector showing "02", "November", and "2018", with a note: "or date when the local night starts. *Staralt, Startrack only.*"
- Observatory:** A dropdown menu set to "Cerro Tololo Observatory (Chile)". Below it, a text input field contains the coordinates: "Longitude(*E) Latitude(*N) Altitude(metres) UT-offset(hours)" and an example: "Ex.: 285.2767 -30.2283 2725 -4". A second input field contains: "-56.1 -34.0 100 -3".
- Coordinates:** A text area containing a list of objects and their coordinates:

```
OCBlanco1 00:04:07 -29:50:00
OCESC24509 01:53:43 -45:57:12
GCNGC288 00:52:45 -26:34:57.4
Whiting1 02:0:57 -03:15:10
```

Visibilidad: Calculador StarAlt

The screenshot shows the StarAlt calculator web interface. The browser address bar displays 'catserver.ing.iac.es'. The interface is divided into several sections:

- Mode:** Staralt (selected)
- Night:** 02 November 2013 (circled in green)
- Observatory:** Cerro Tololo Observatory (Chile) (selected). Below it, a text input field contains '-56.1 -34.0 100. -3' (circled in green).
- Coordinates:** A text area containing a list of target coordinates: OCBlanco1 00:04:07 -29:50:00, OCES024509 01:53:43 -45:57:12, CCNOC268 00:52:45 -26:34:57.4, Whiting1 02:0:57 -03:15:10. A green arrow points to this section with the label 'coordenadas (RA,DEC)'. Below the text area is a 'Choose File' button and the text 'no file selected'.
- Options:** Moon distance (selected), Min. elevation (or max. airmass X) (30°, X=2.0 selected), Output format (GIF [inline] selected).
- Submit:** Retrieve (circled in green) and Help buttons.
- ING telescope limits:** WHT: 09.8° < Altitude < 12° (plot). Targets with +28:57:40>Dec>+28:33:40 won't be accessible when transiting the zenithal blind spot (-0.2° size). INT: 90° < Altitude < 33° (20° if lower shutter raised), -6h < HA < +6, +90°>Dec>-30° 09' 30" (-HA Dec plot - lower shutter raised; lowest altitude Dec plot).
- More:** These are other useful resources for planning observations: [Observe](#), [astronomy tools](#), [JSkyCalc](#), [obstools](#), [NOT's visplot](#).

Fecha

Datos del lugar

coordenadas (RA,DEC)

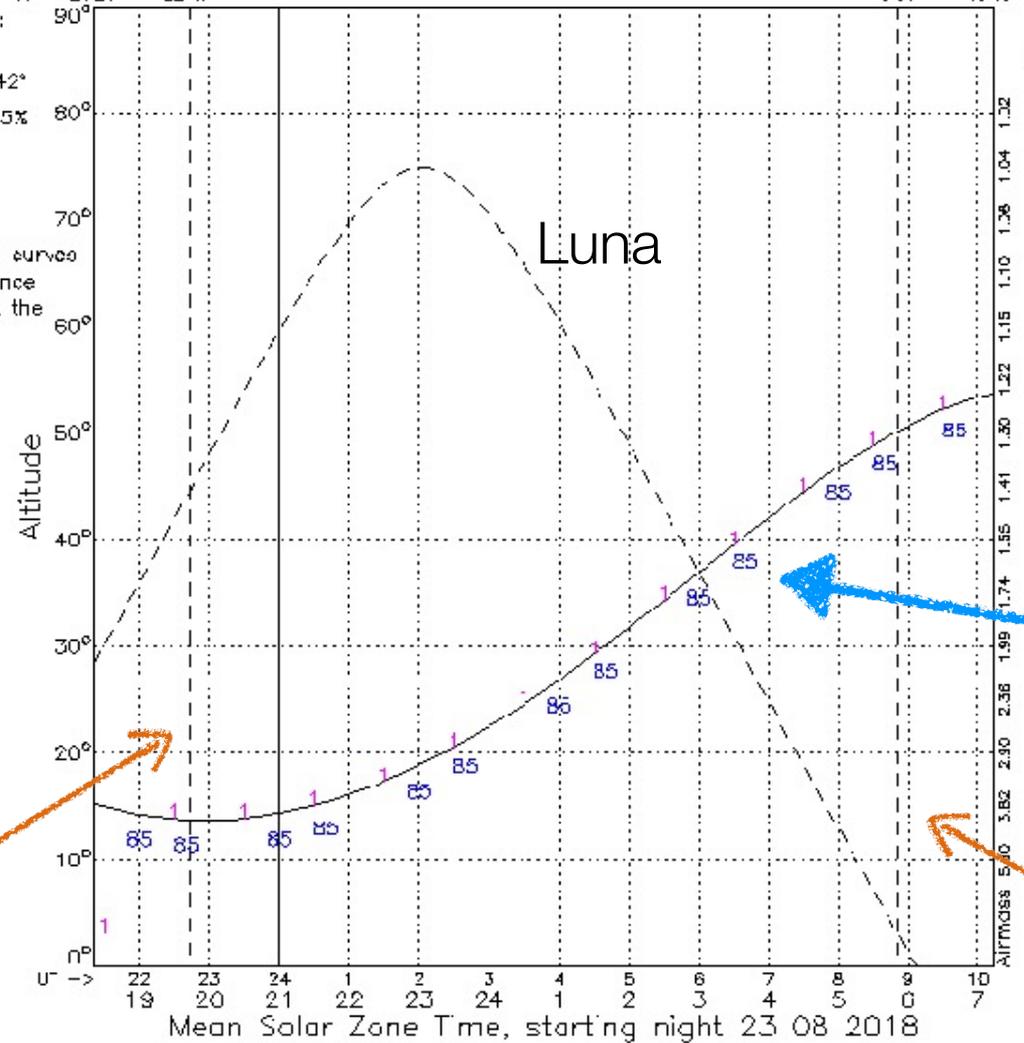
Visibilidad: Calculador StarAlt

Altitudes, Observing site coordinates: $-56.1000E -34.0000N$, 100 m above sea level
 tiempo sideral LST ----> 21^h21^m 22^h43^m
 S.set 17^h24^m 18^h24^m 19^h24^m 20^h24^m 21^h24^m 22^h24^m 23^h24^m 24^h24^m 25^h24^m 26^h24^m 27^h24^m 28^h24^m 29^h24^m 30^h24^m
 Twil 0^h50^m S.rise 10^h13^m

Moon (dashed):
 Coordinates:
 $20^{\circ}33' -16^{\circ}42'$
 Illumination: 95%
 Quarter: 2

List of objects:
 1 LMC $5^h23^m -65^{\circ}45'$

Numbers below curves
 are Moon distance
 (in degrees) at the
 corresponding
 times.



Objeto

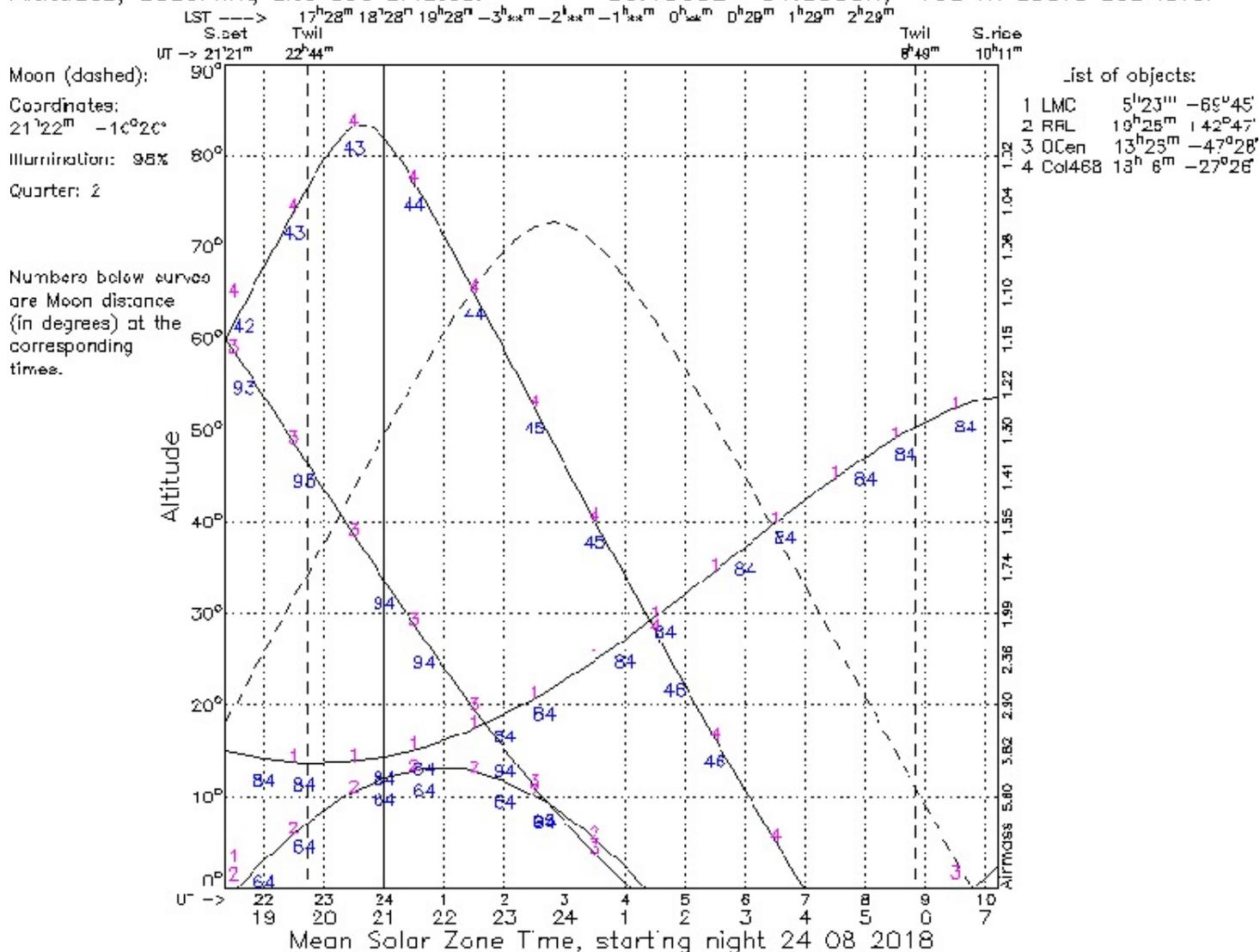
Objeto
 distancia a
 la Luna

crepúsculo
 vespertino

crepúsculo
 matutino

Visibilidad: Calculador StarAlt

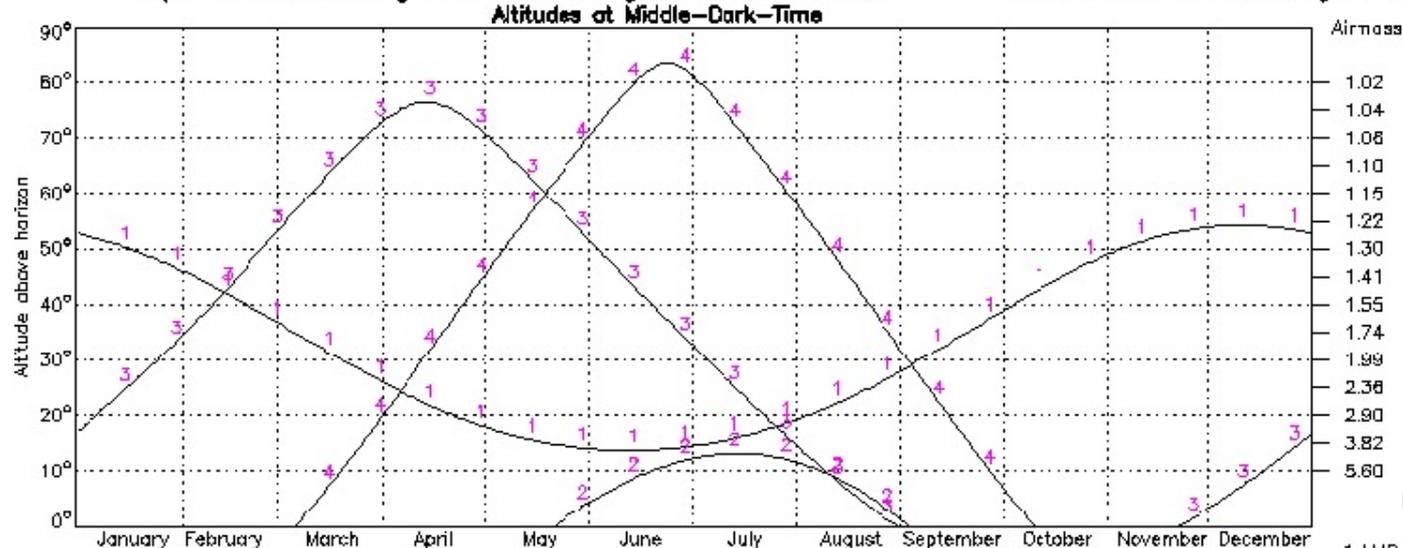
Altitudes, Observing site coordinates: $-56.1000E$ $-34.0000N$, 100 m above sea level



Visibilidad durante el año: Calculador StarObs

Optimum observing time, Observing site coordinates:

-56.1000E -34.0000, year 2018

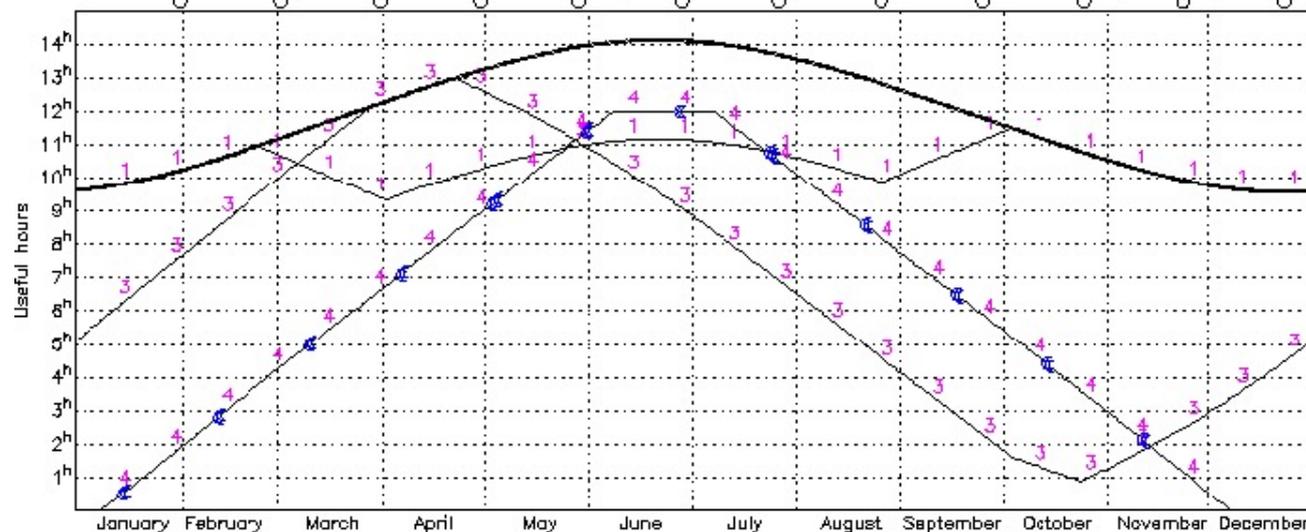


List of objects

- 1 LMC $5^{\text{h}}23^{\text{m}} -89^{\circ}45'$
- 2 RRL $19^{\text{h}}25^{\text{m}} +42^{\circ}47'$
- 3 OCen $13^{\text{h}}26^{\text{m}} -47^{\circ}28'$
- 4 Col468 $18^{\text{h}} 6^{\text{m}} -27^{\circ}26'$

Sunless hours above altitude 15°

Circles above frame represent Full Moon and the "C" symbol on a curve means the Moon is closer than 15°
The thick dotted line above the curves represents the total sunless hours for each day of the year



Tiempo sidéreo

$$\text{TSL} = H_\gamma = \alpha + H \quad \text{TSL} - \text{Tiempo sidéreo local}$$

$$\text{TSL} = \text{TSG}_t + \lambda^\circ/15 \quad (\lambda: + E, - W)$$

TSG_t – Tiempo sidéreo de Greenwich a un tiempo t

$$\text{TSG}_t = \text{TSG}_0 + 1.0027379 \text{ TU}$$

TSG_0 – Tiempo sidéreo de Greenwich a 0h de TU

TU – Tiempo Universal

TU = Hora Legal – Huso (Huso: -3h Invierno)

$$\text{TU} = (\text{TSG}_t - \text{TSG}_0)/1.0027379$$

$$\text{TSG}_0 = 18.697374558 + 24.06570982441908 D_0$$

$D_0 = \text{JD}_0 - 2451545.0$ (2000 Enero 1, 12h TU, J2000)

JD_0 – Día Juliano a 0h TU

Días Julianos

- JD 0 : 1/1/-4712 (4713 AC) 12h TU
- 1/1/2000 12hTU: JD 2451545.0 (J2000)
- 1/1/2020 0h TU: JD 2458849.5
- 1/1/2021 0h TU: JD 2459215.5