

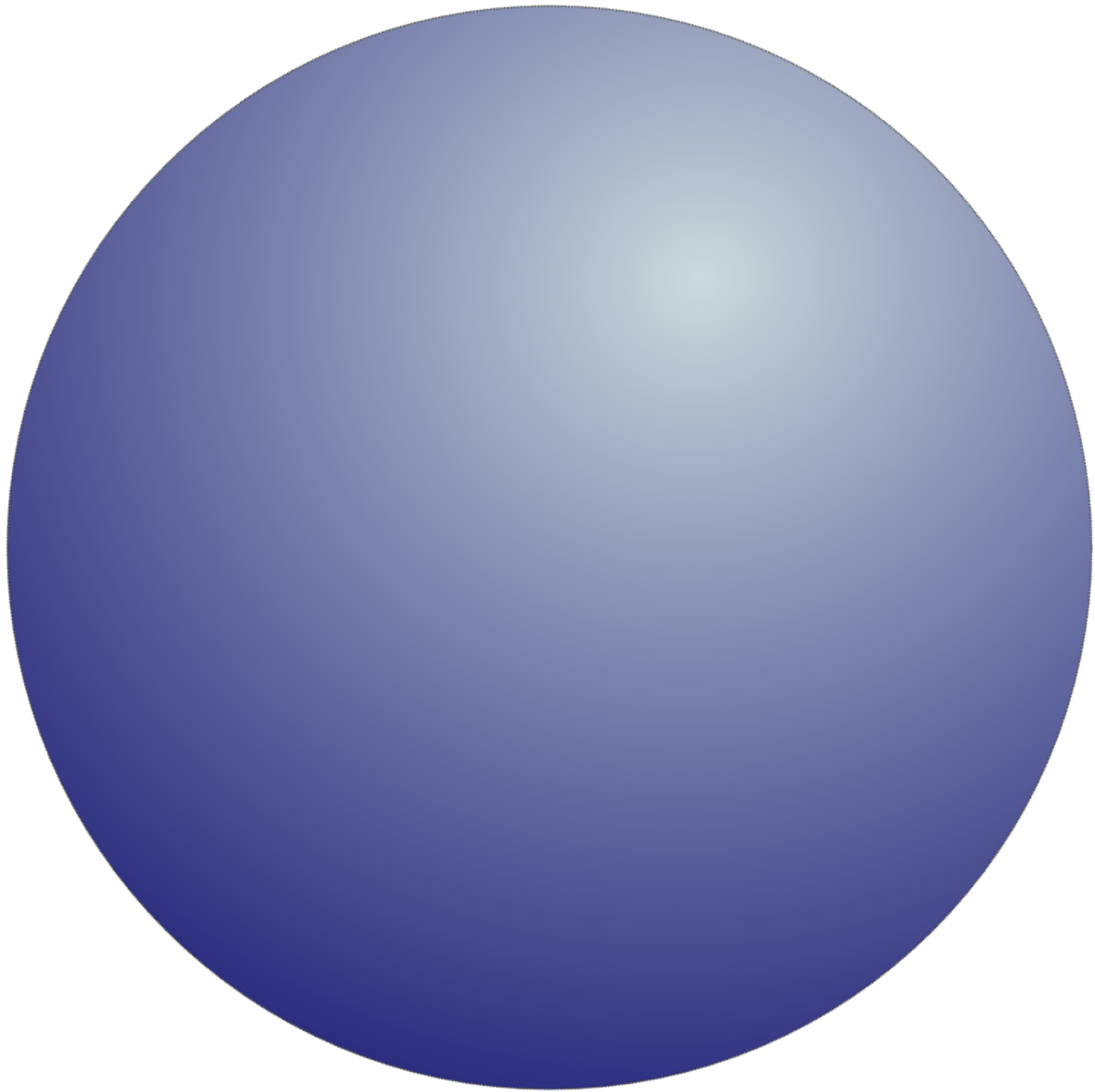


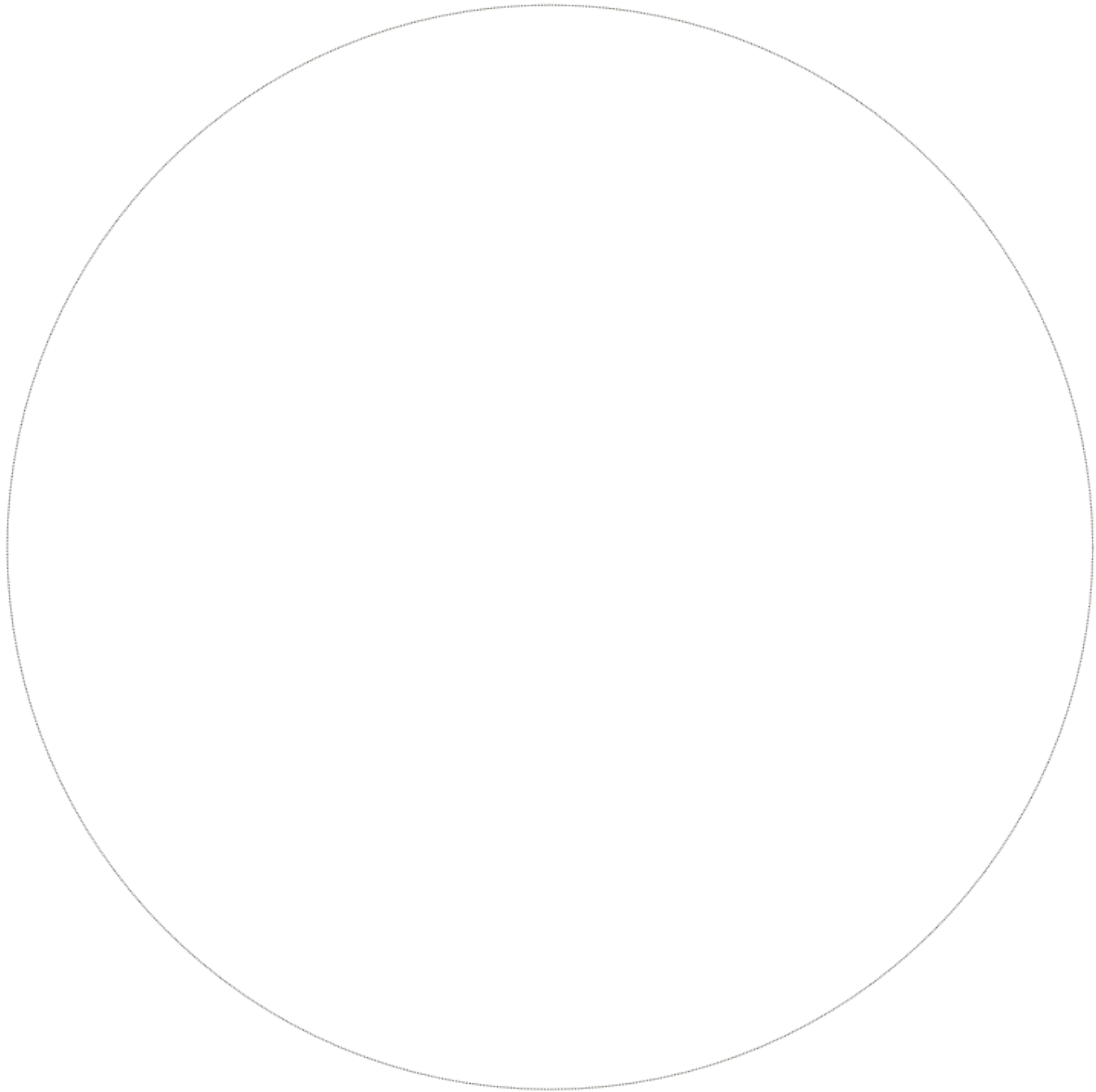
Sfera niebieska, kąty, współrzędne na niebie, ruch dobowy.

Piotr A. Dybczyński

Ilustracje zawarte w tym wykładzie są w większości mojego autorstwa, w pozostałych przypadkach podane jest źródło. Przy tworzeniu niektórych obrazków wykorzystałem elementy następujących grafik:

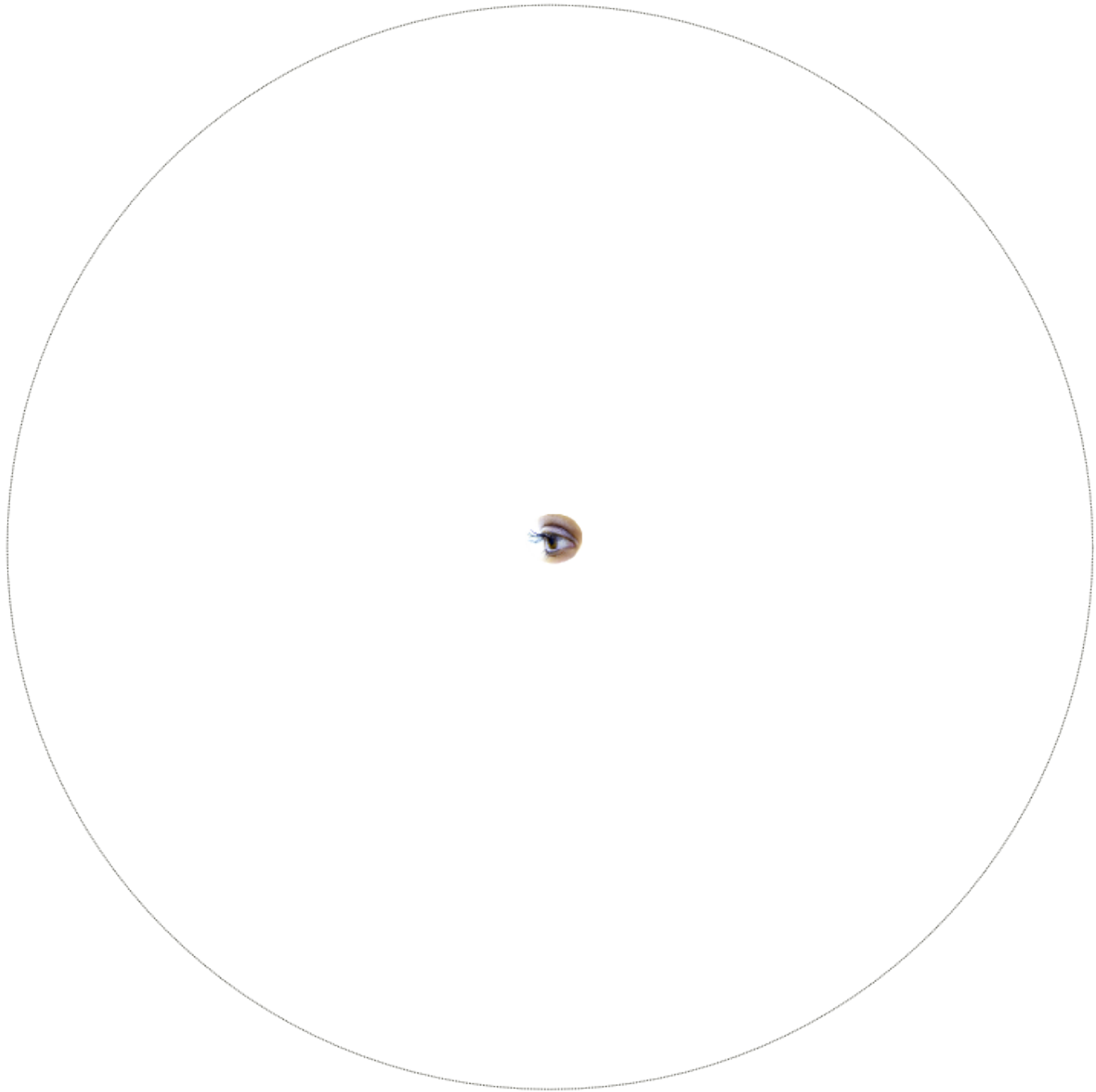
- http://commons.wikimedia.org/wiki/File:Eye_lashes_with_makeup.jpg
- http://en.wikibooks.org/wiki/File:Polaris_Altitude.svg
- http://en.wikibooks.org/wiki/File:Celestial_Sphere.bjb.svg

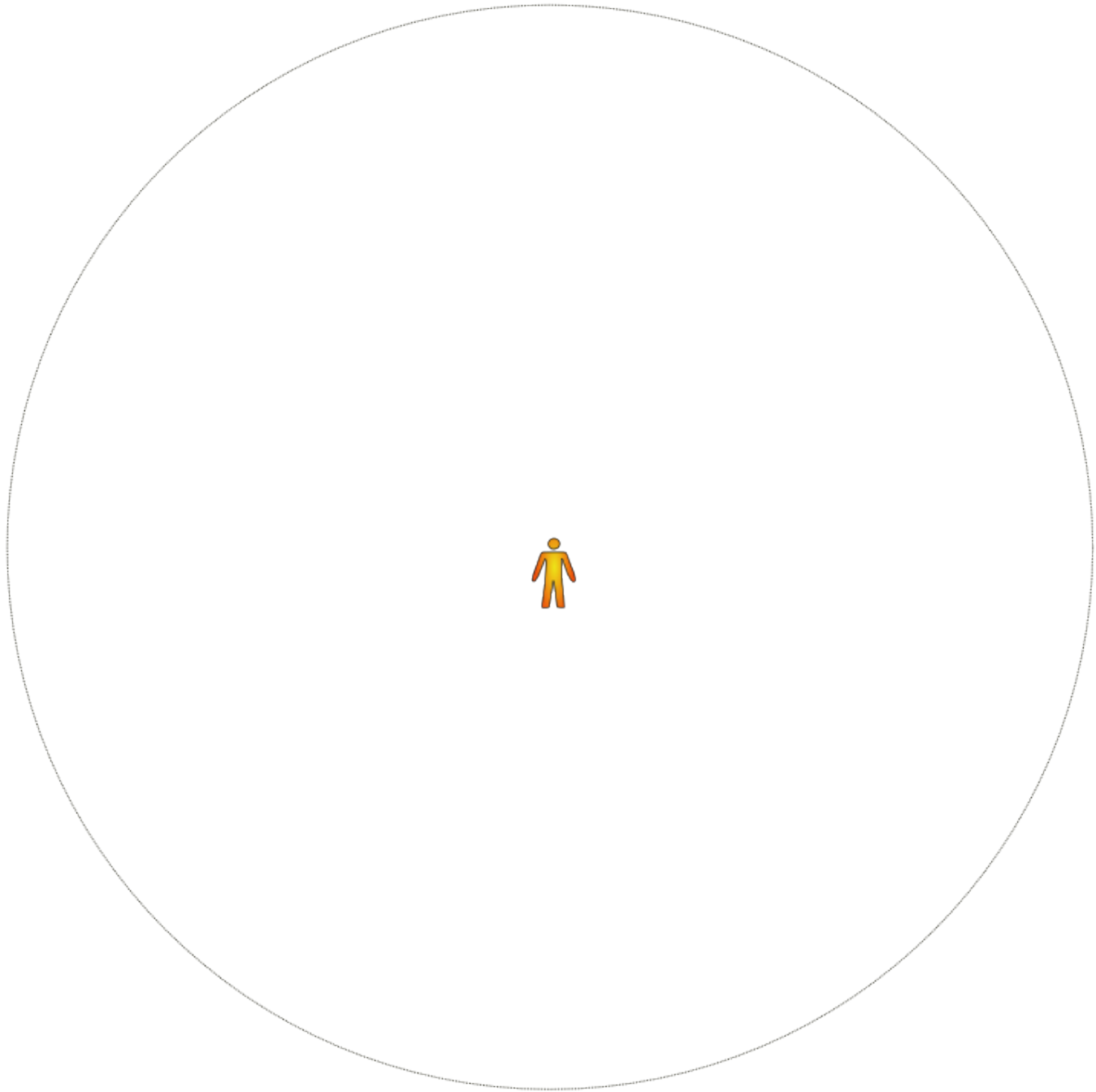


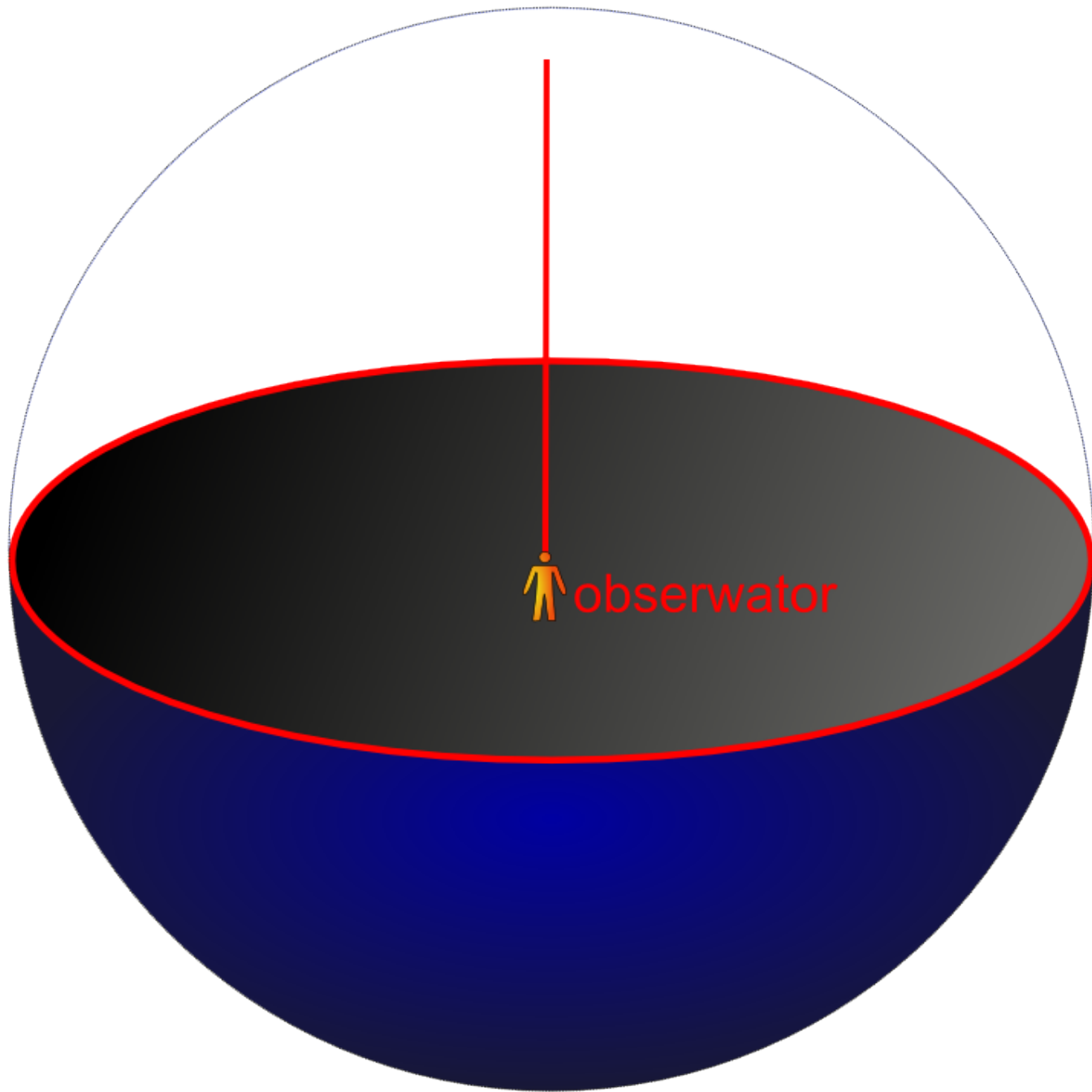








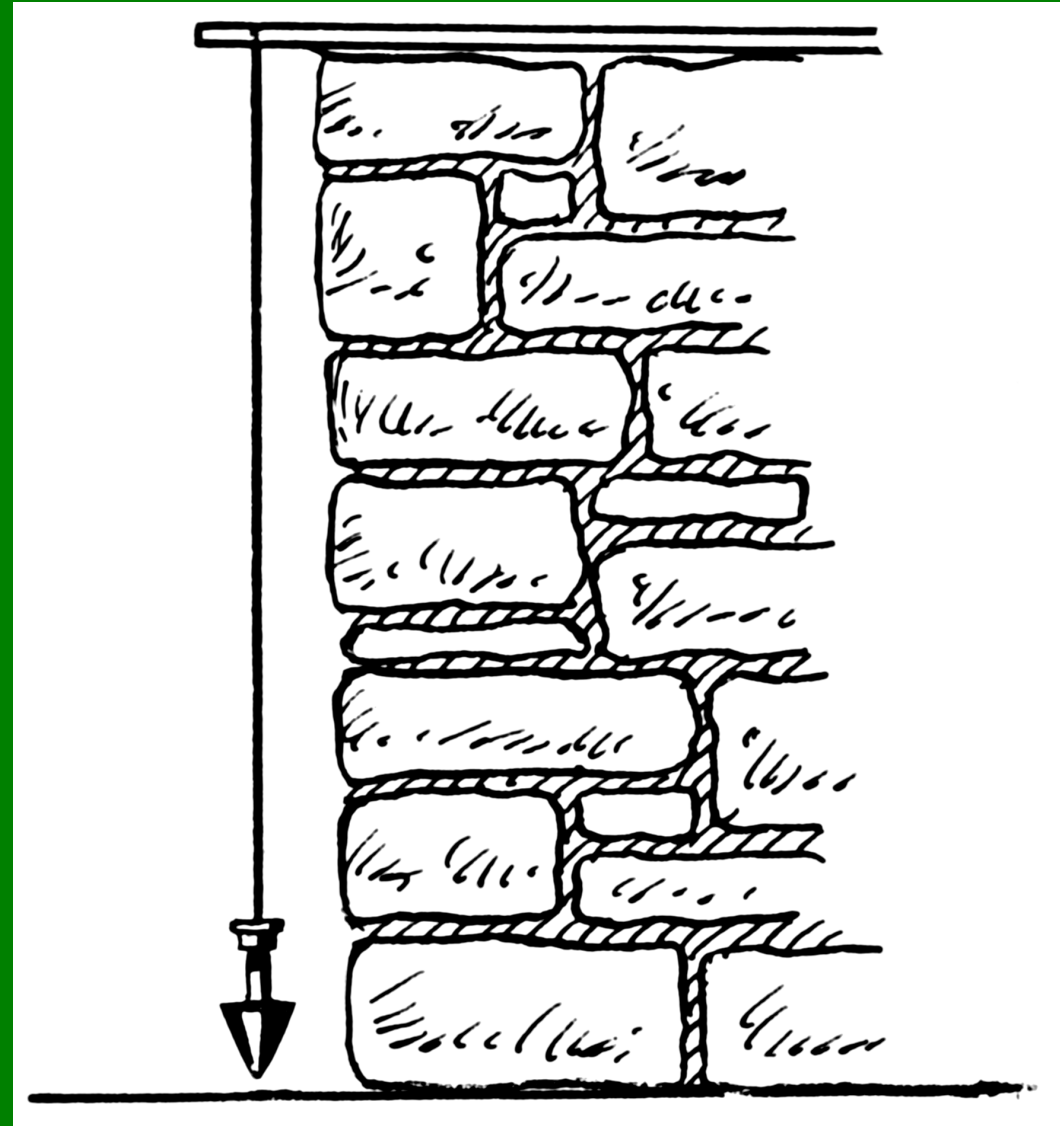


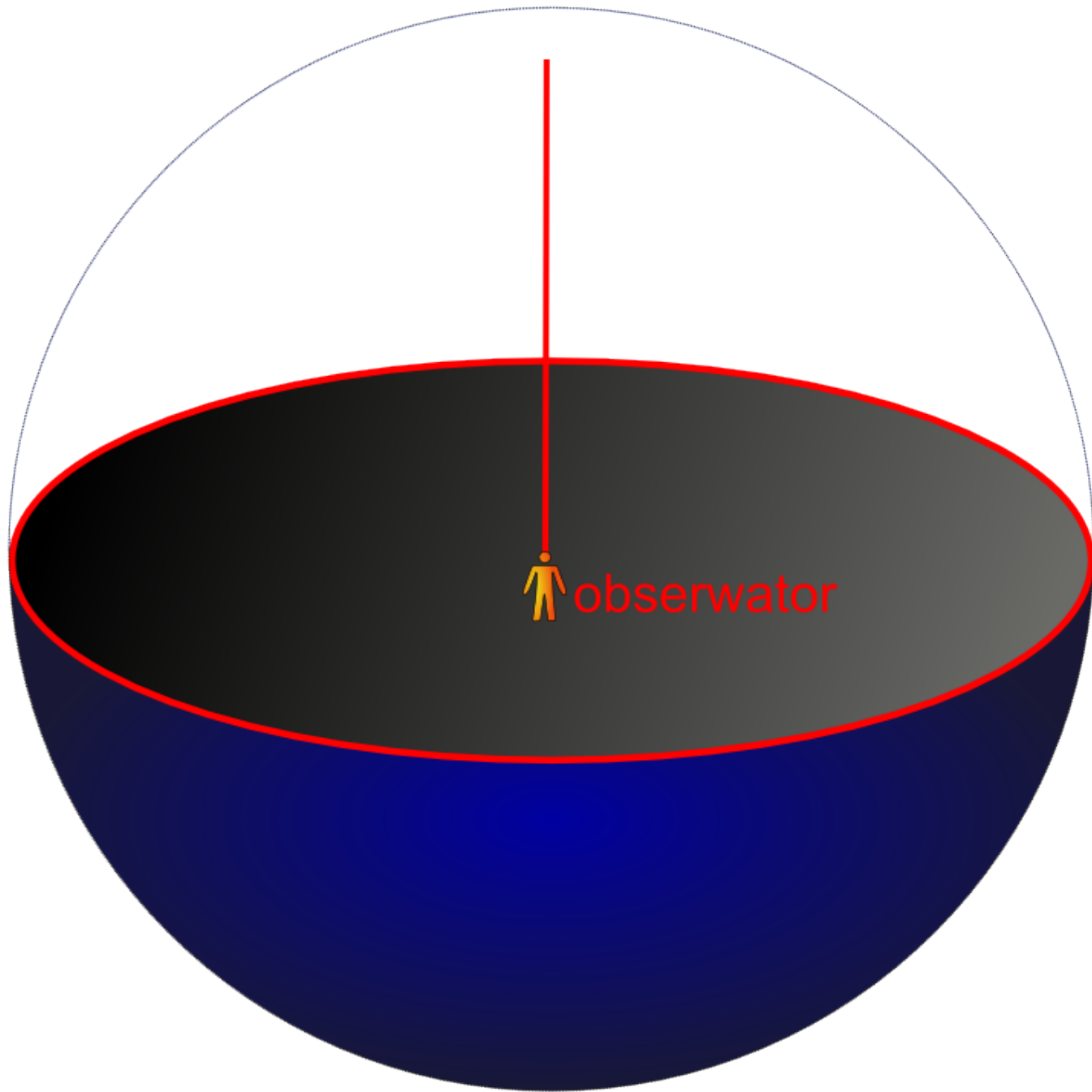


Pion

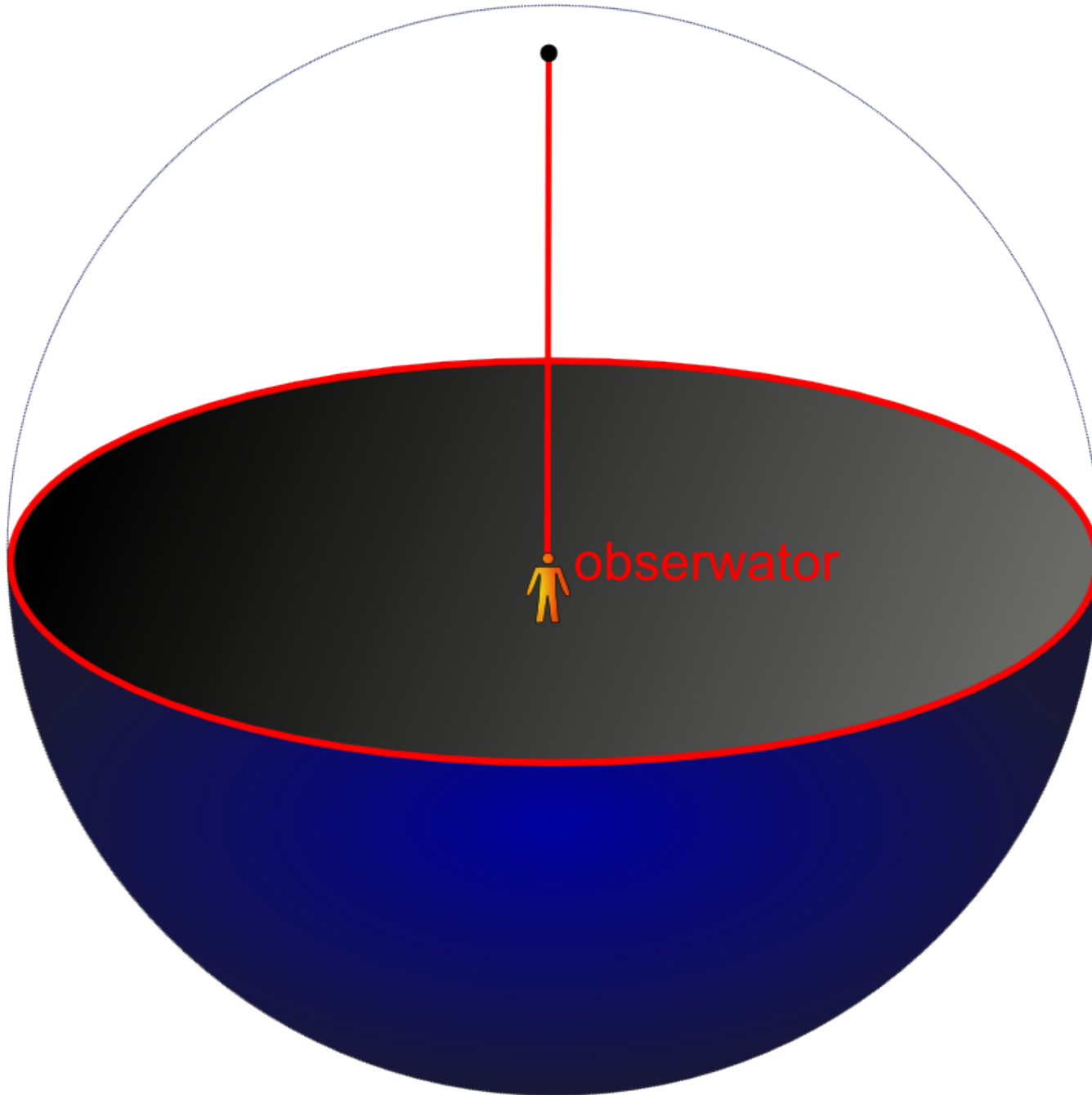


Fot: Wikimedia by Rob

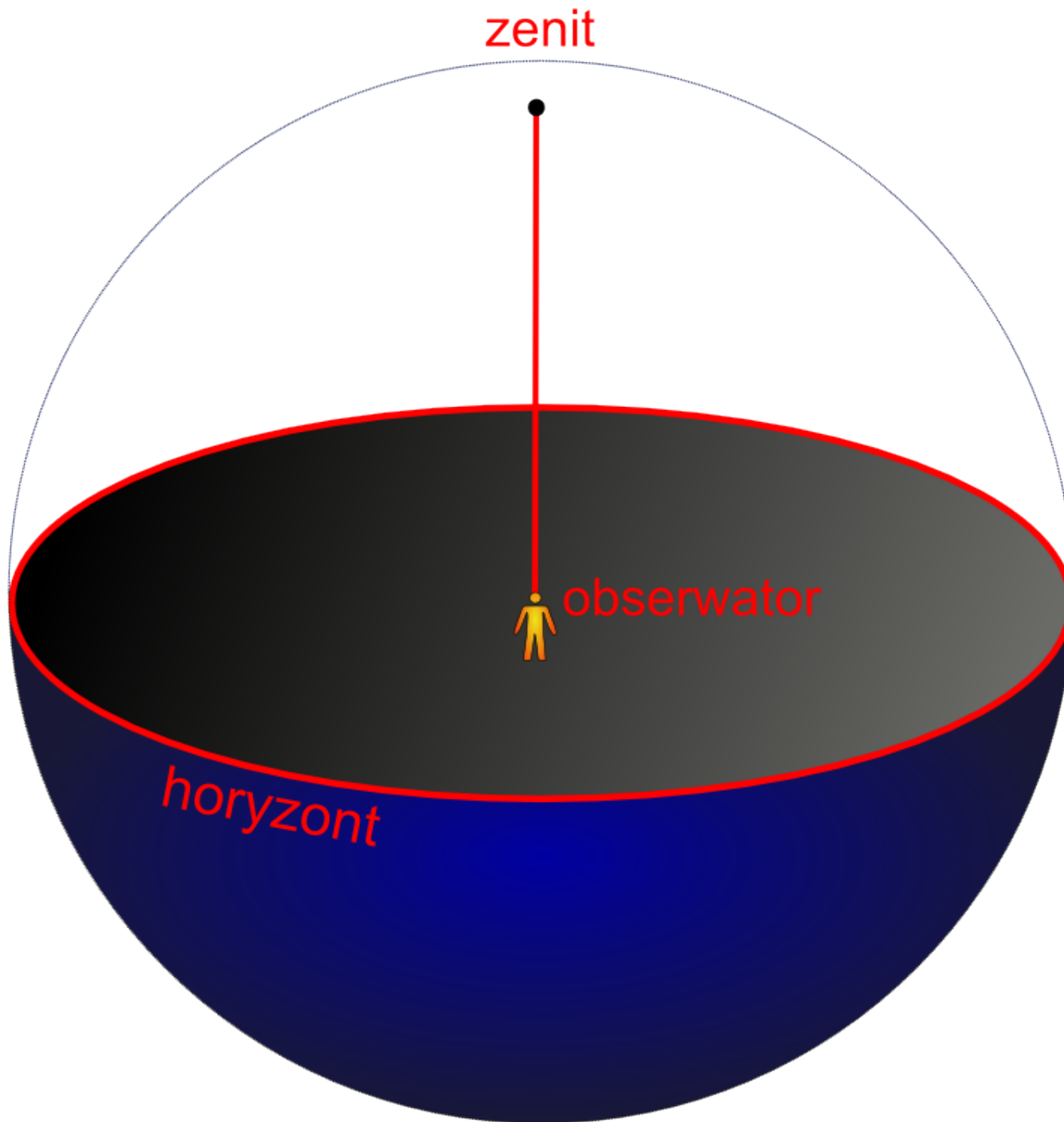


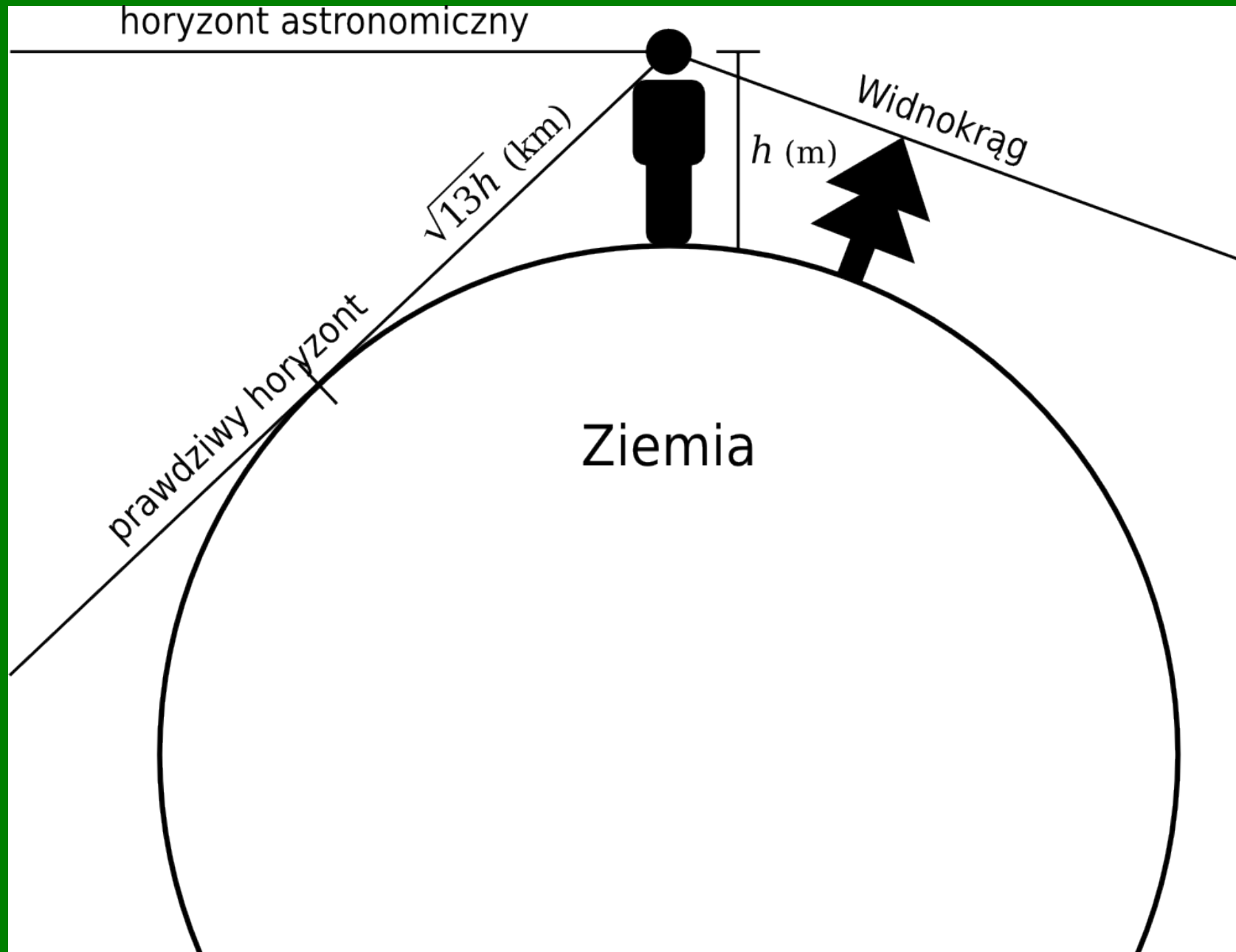


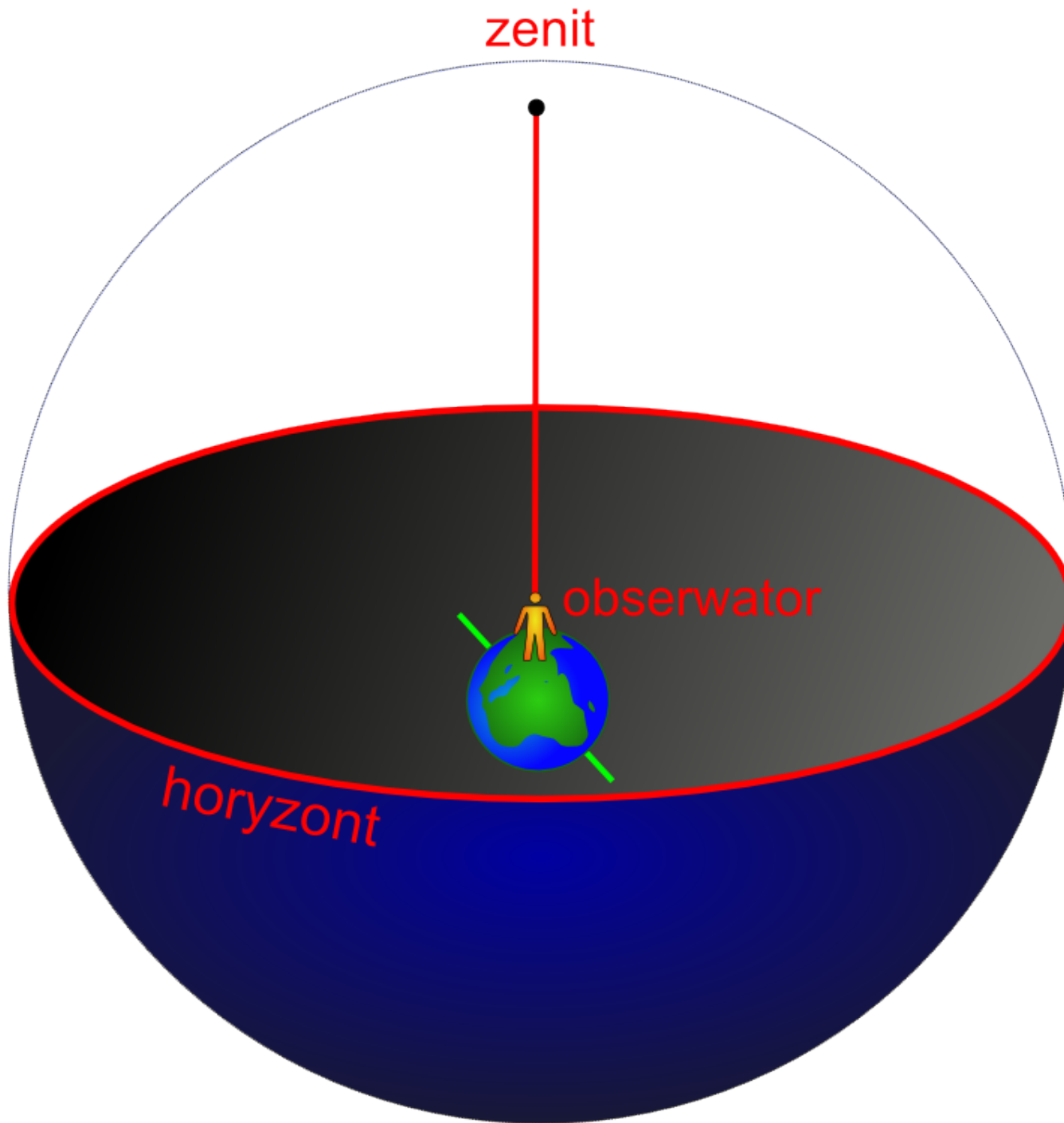
zenit

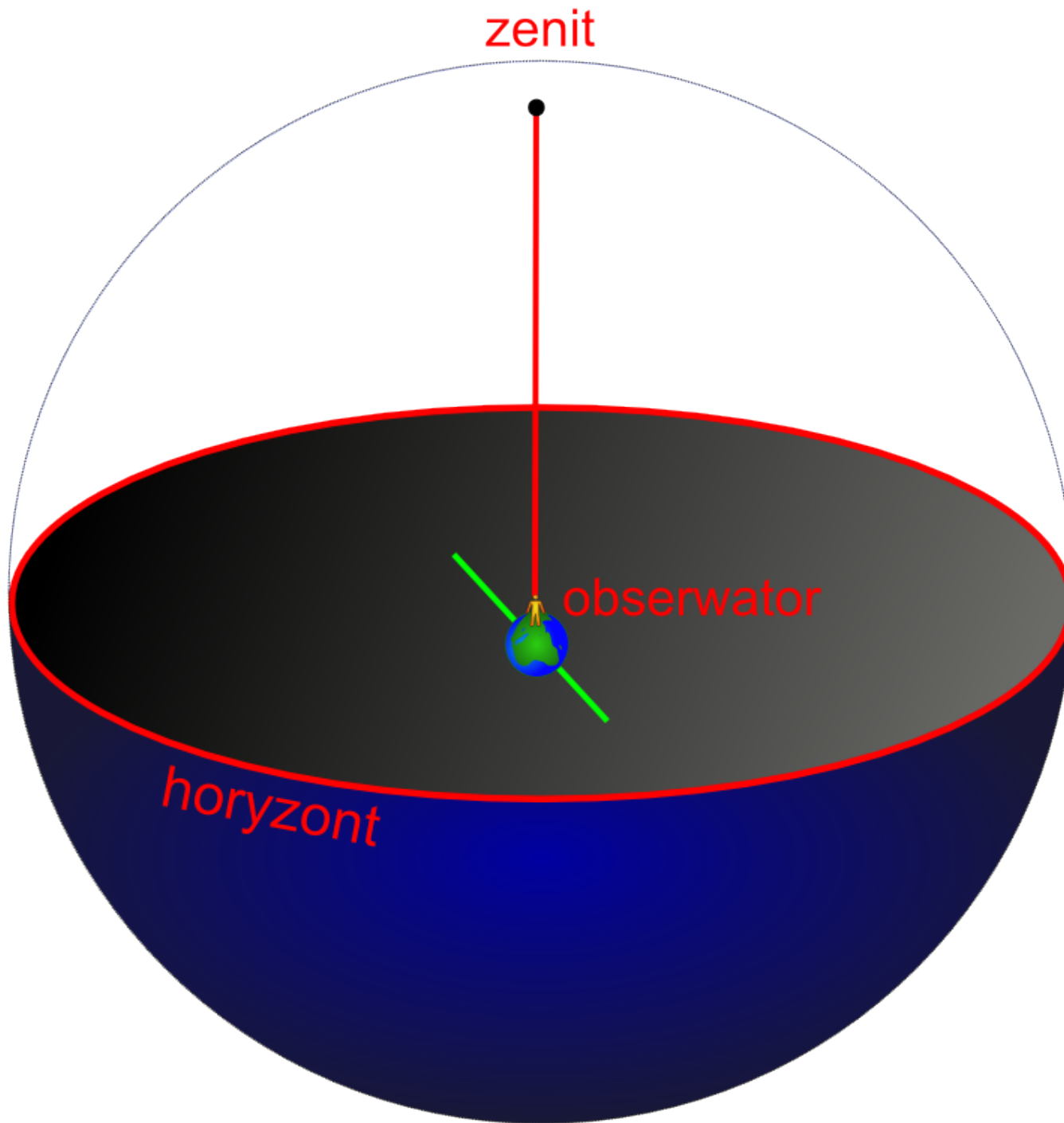


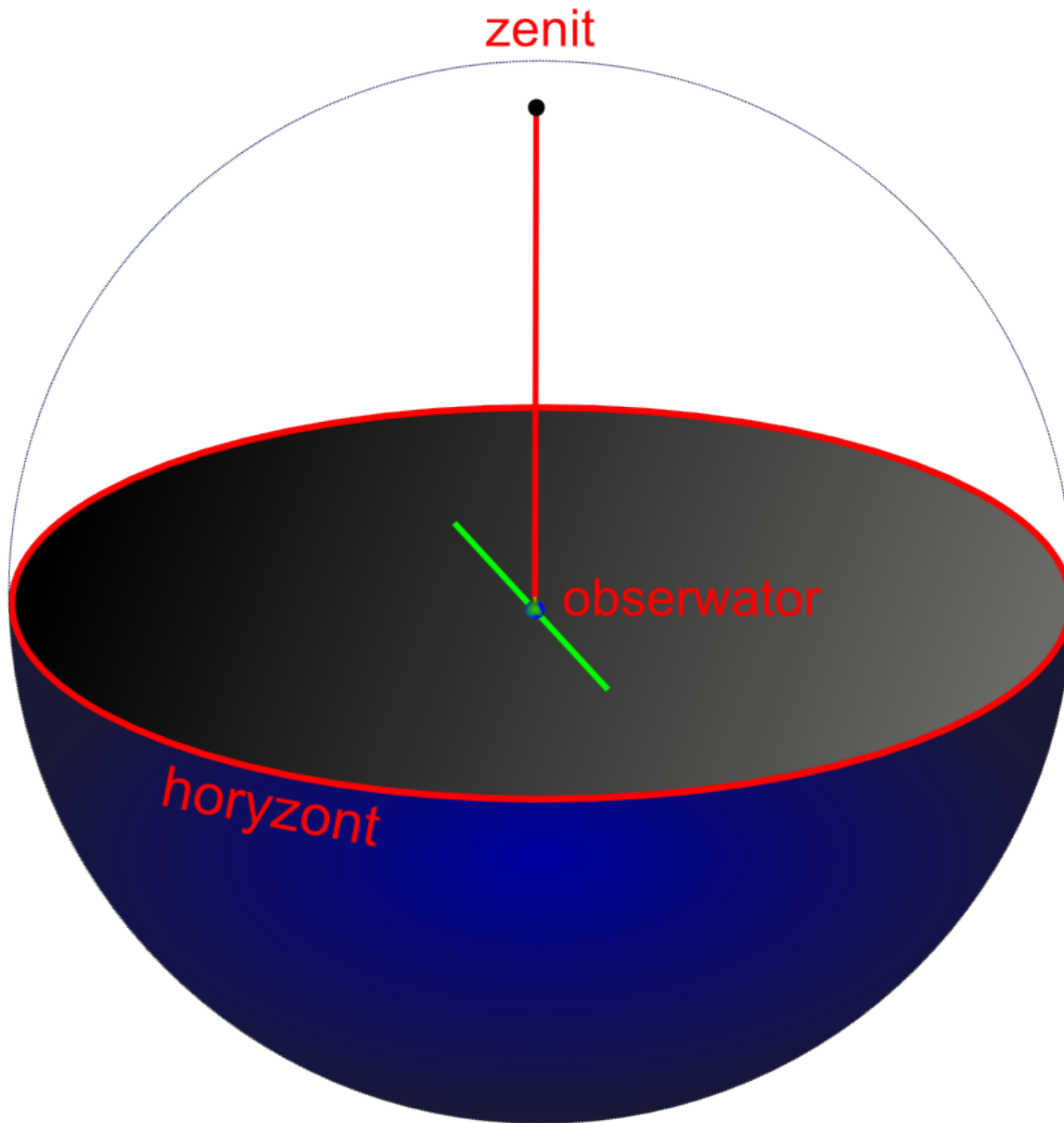
observer

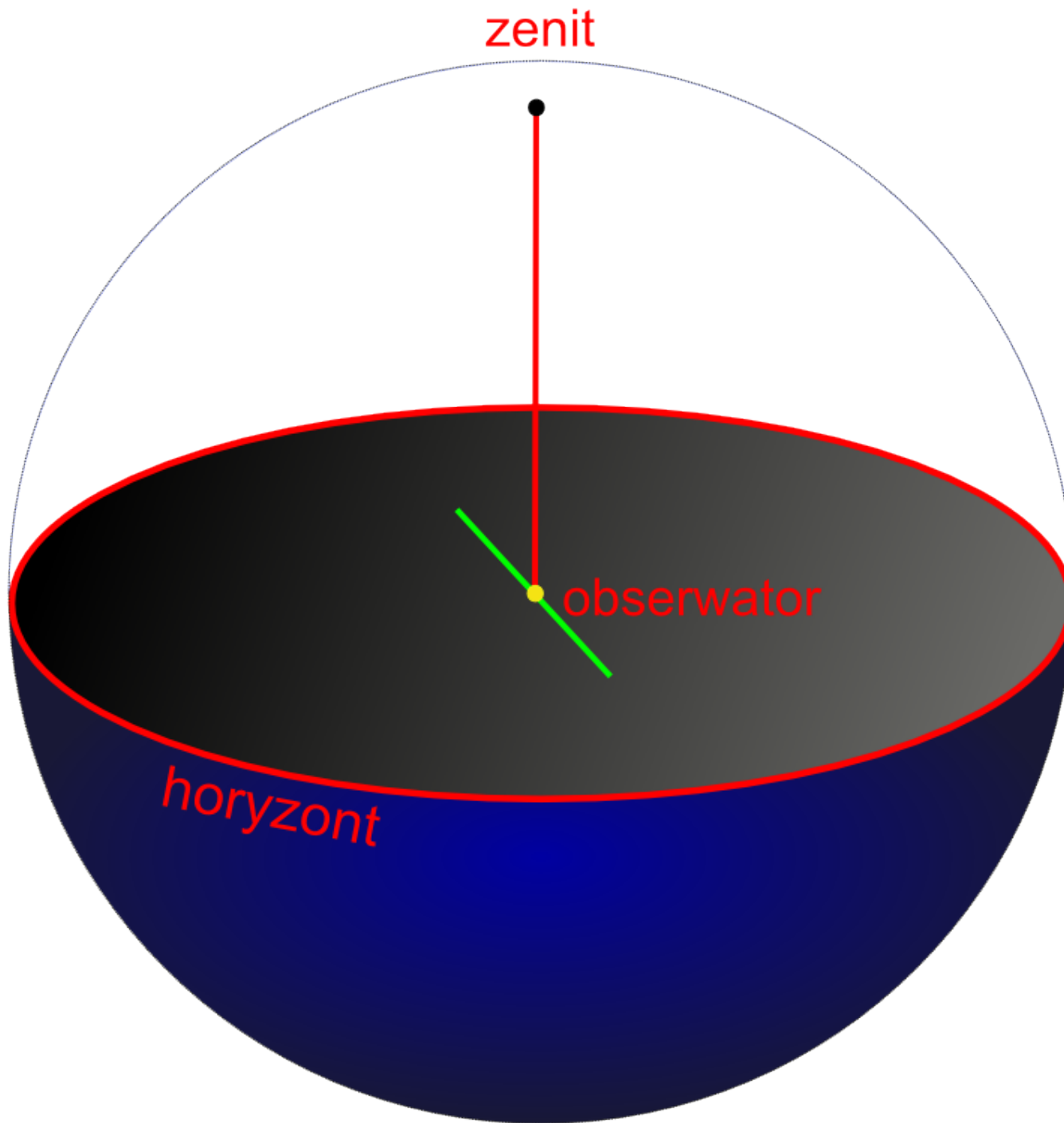


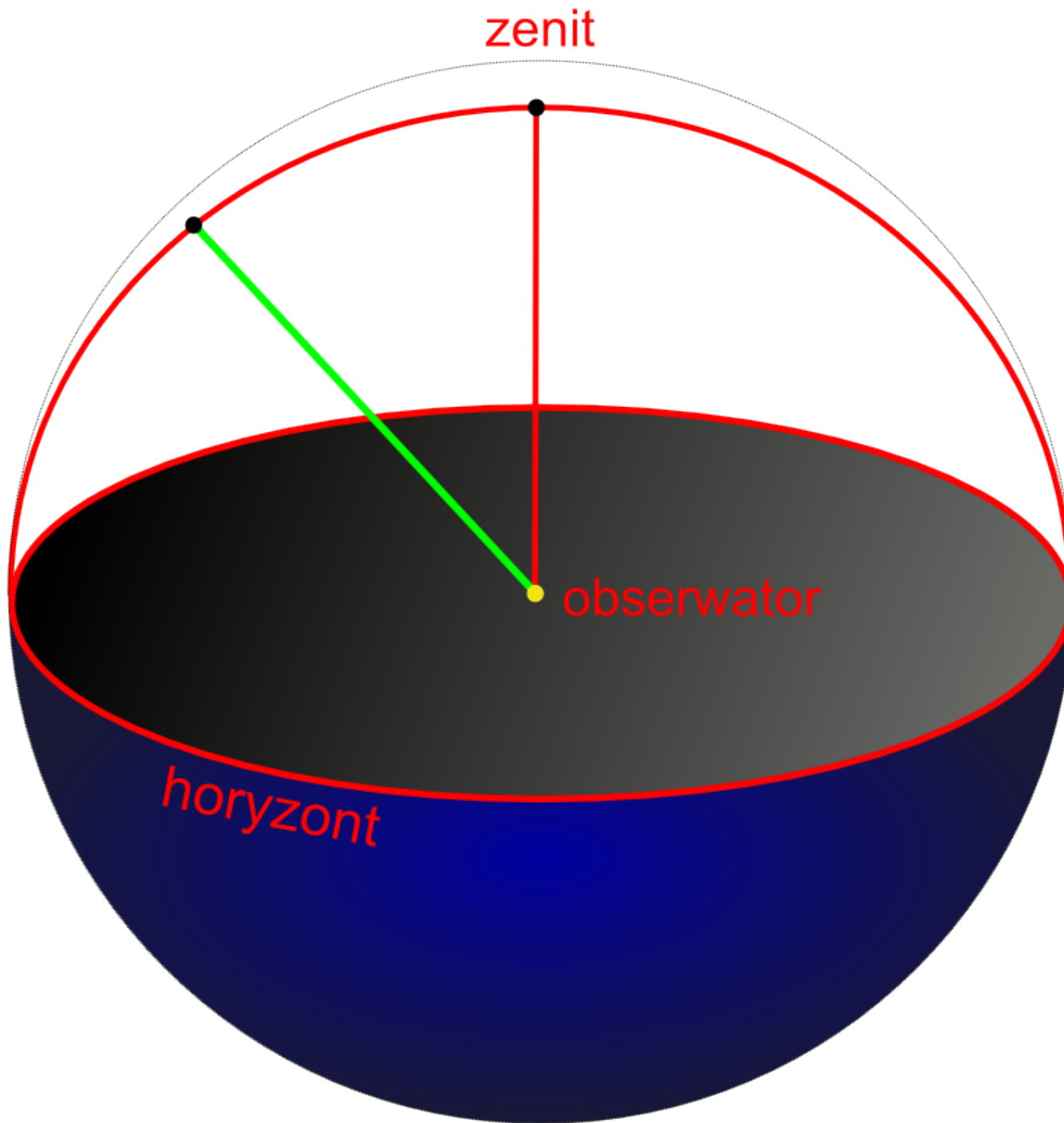


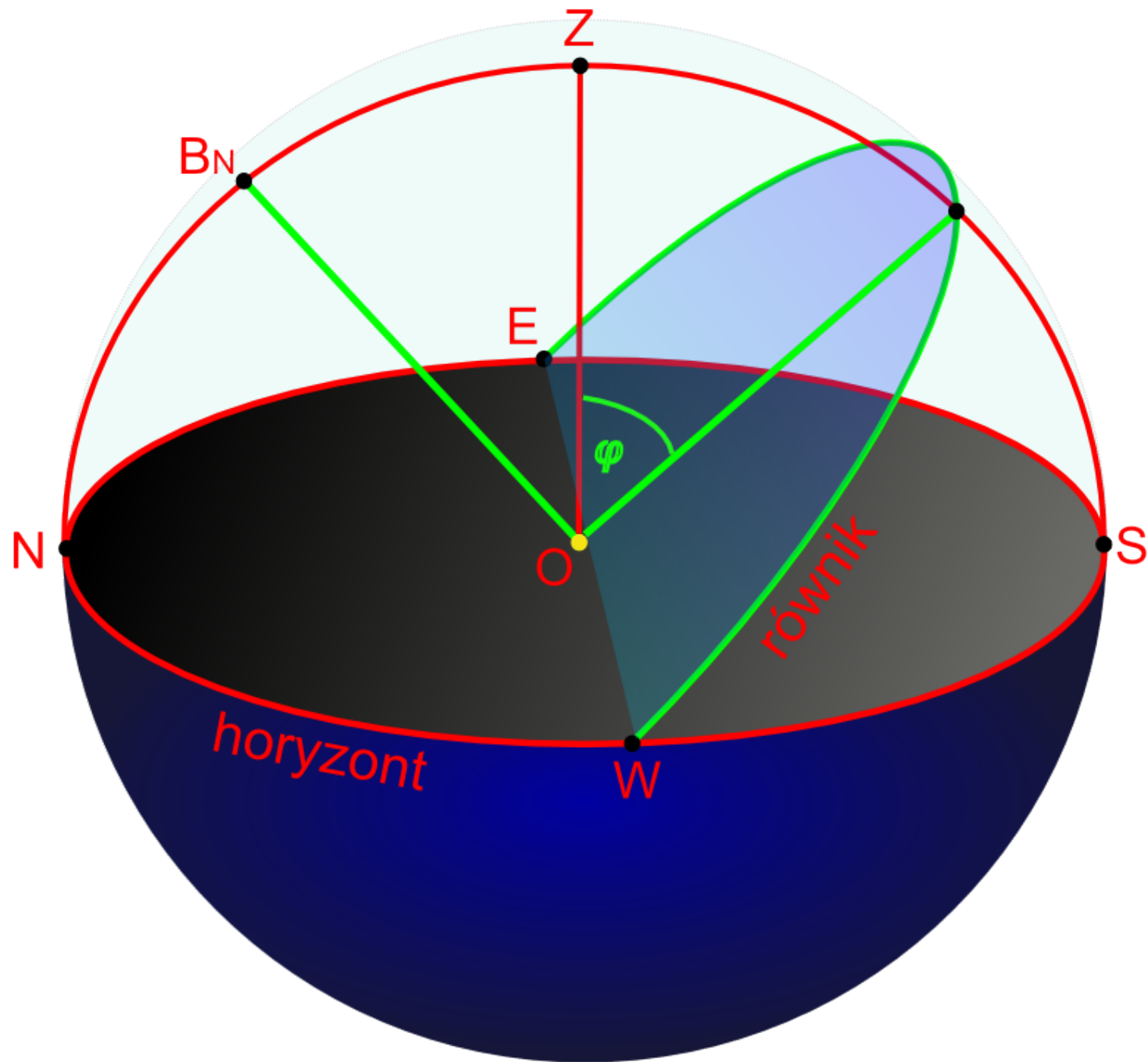


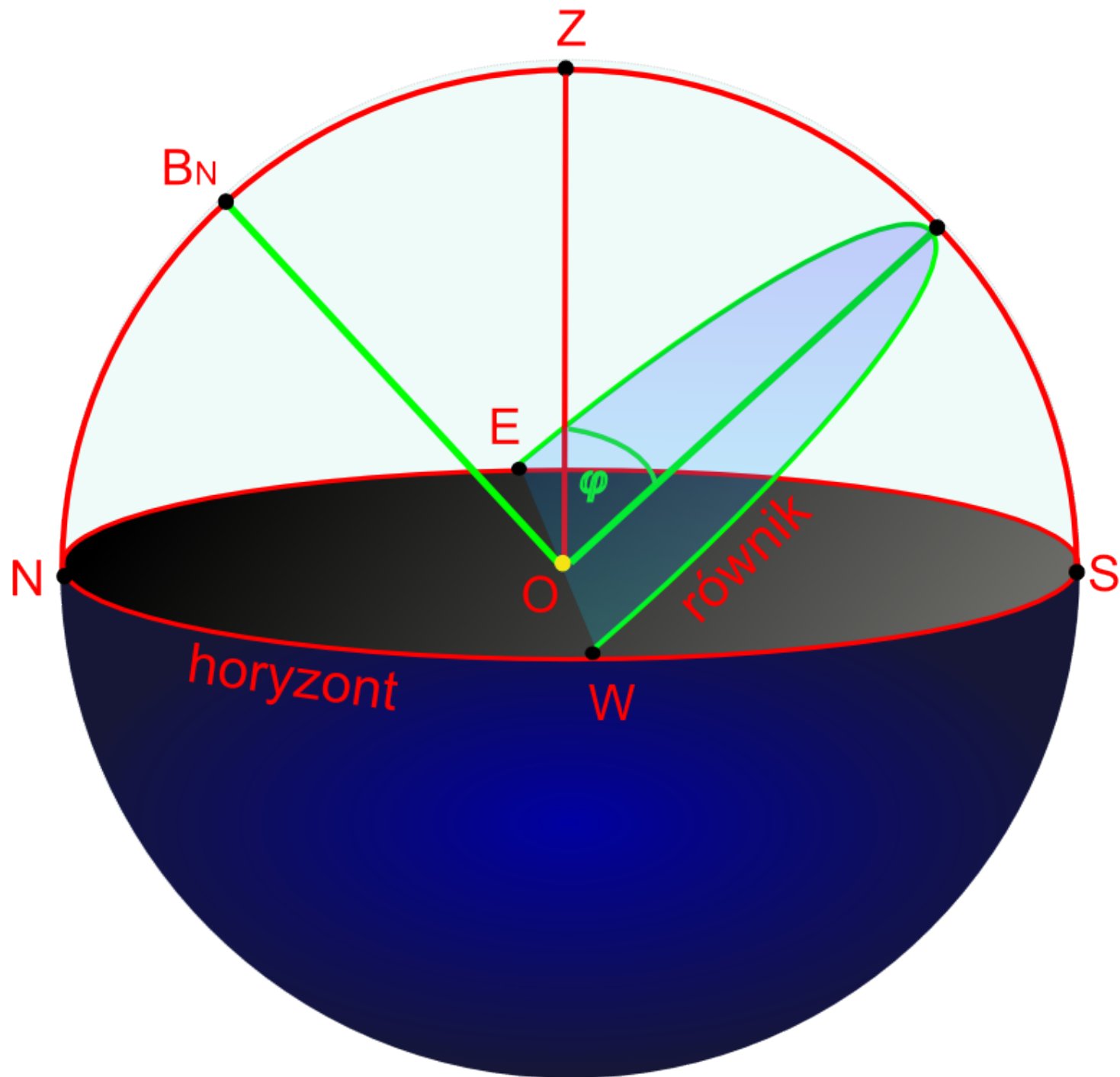


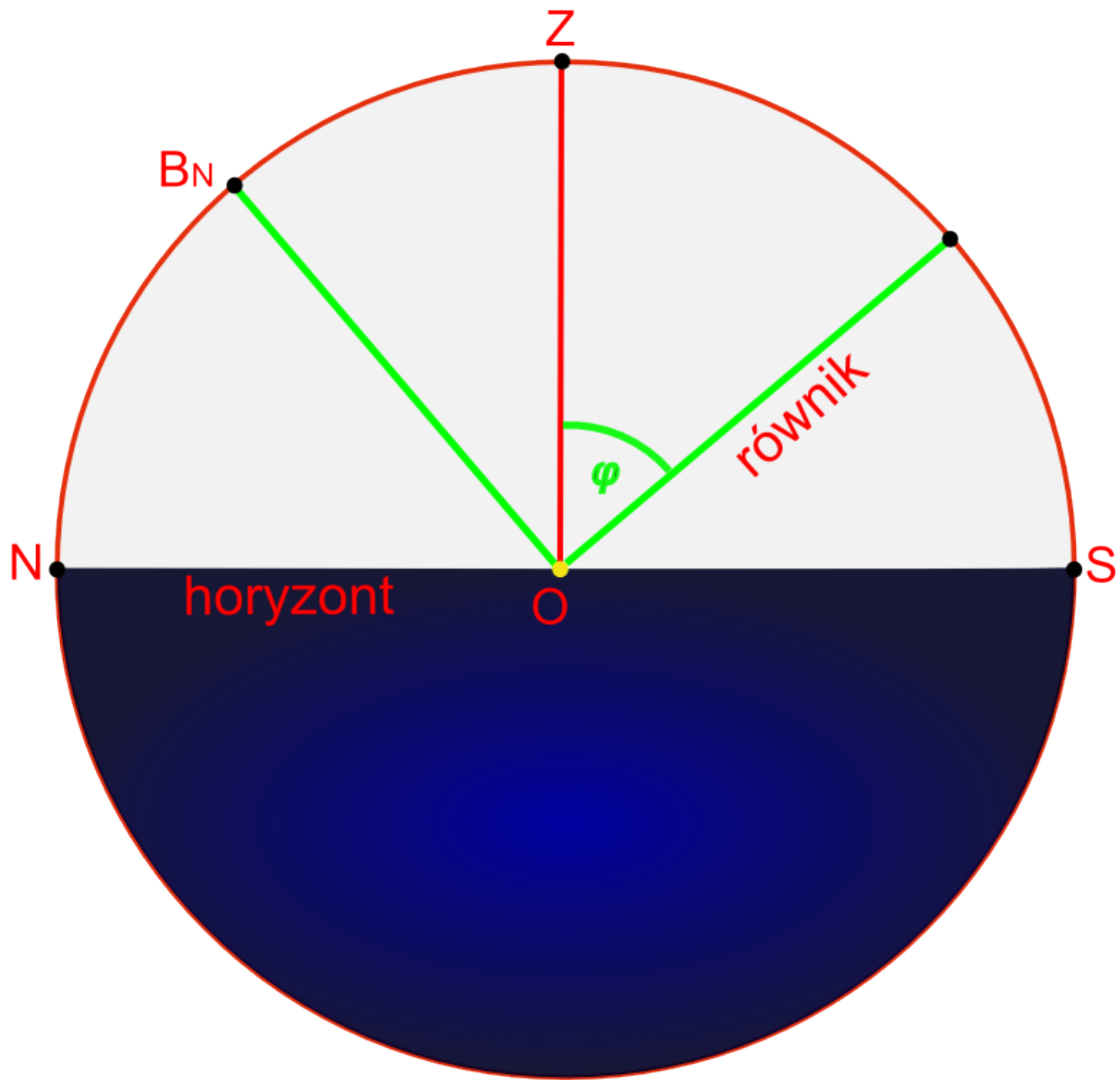


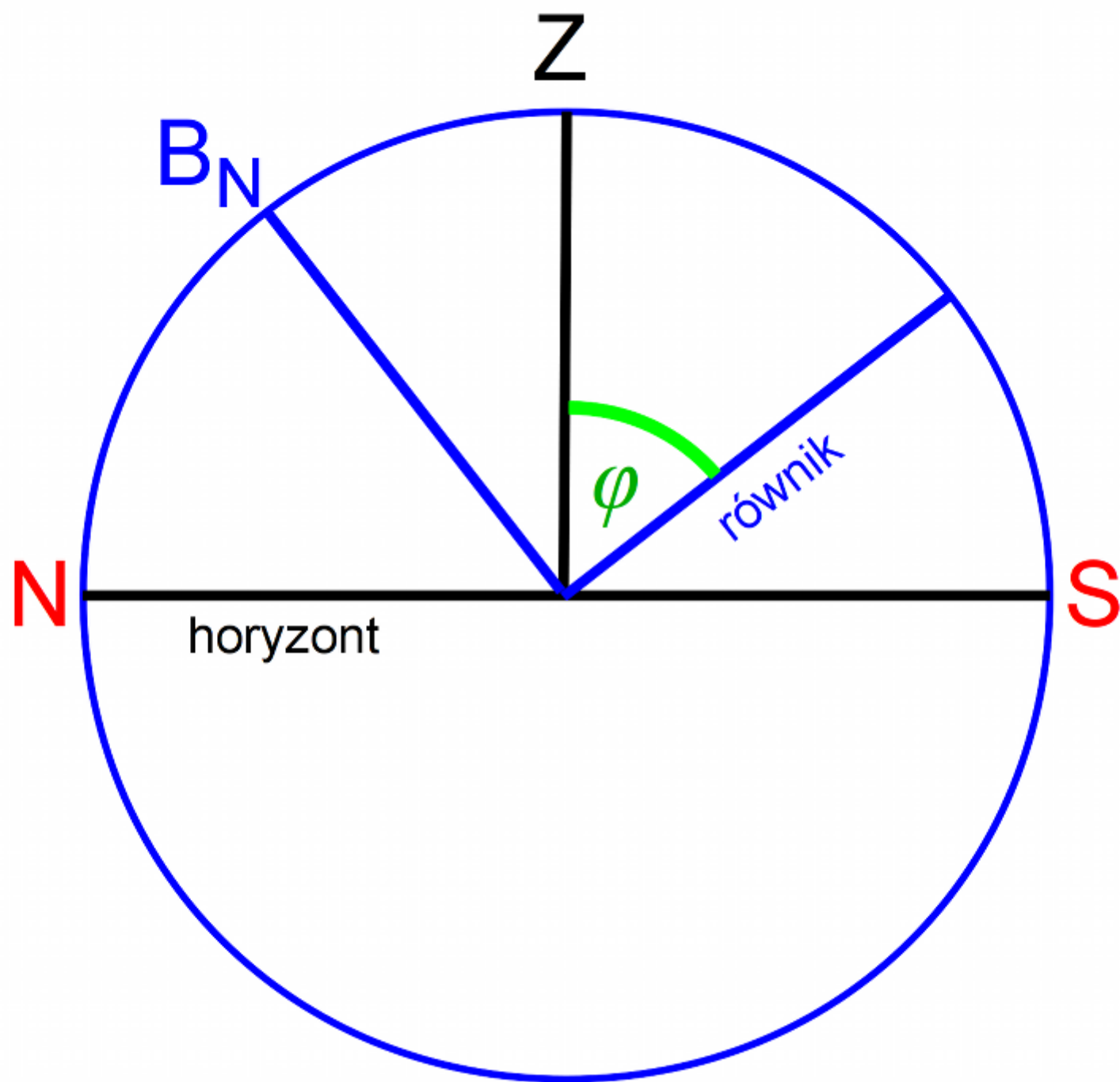


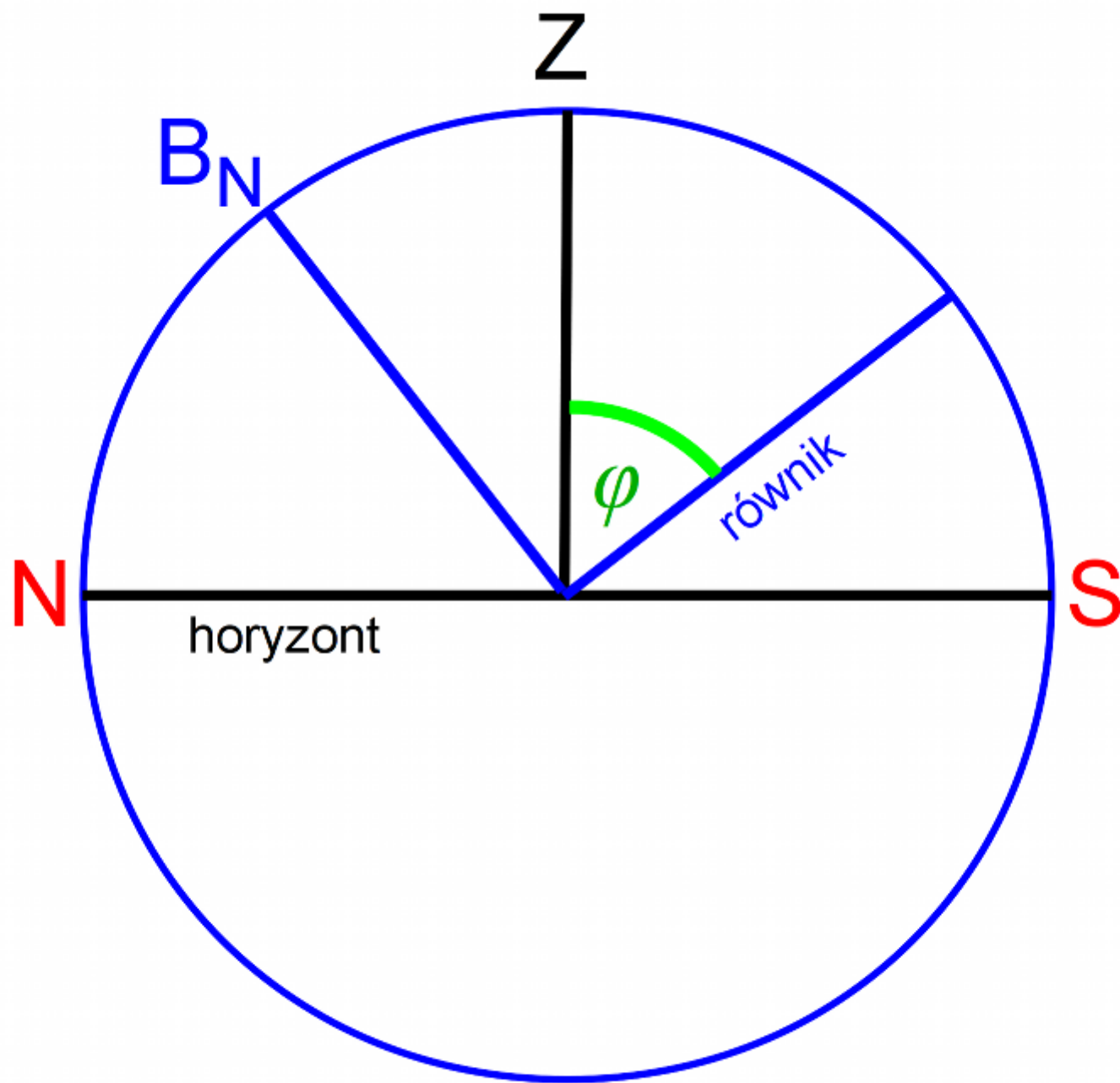




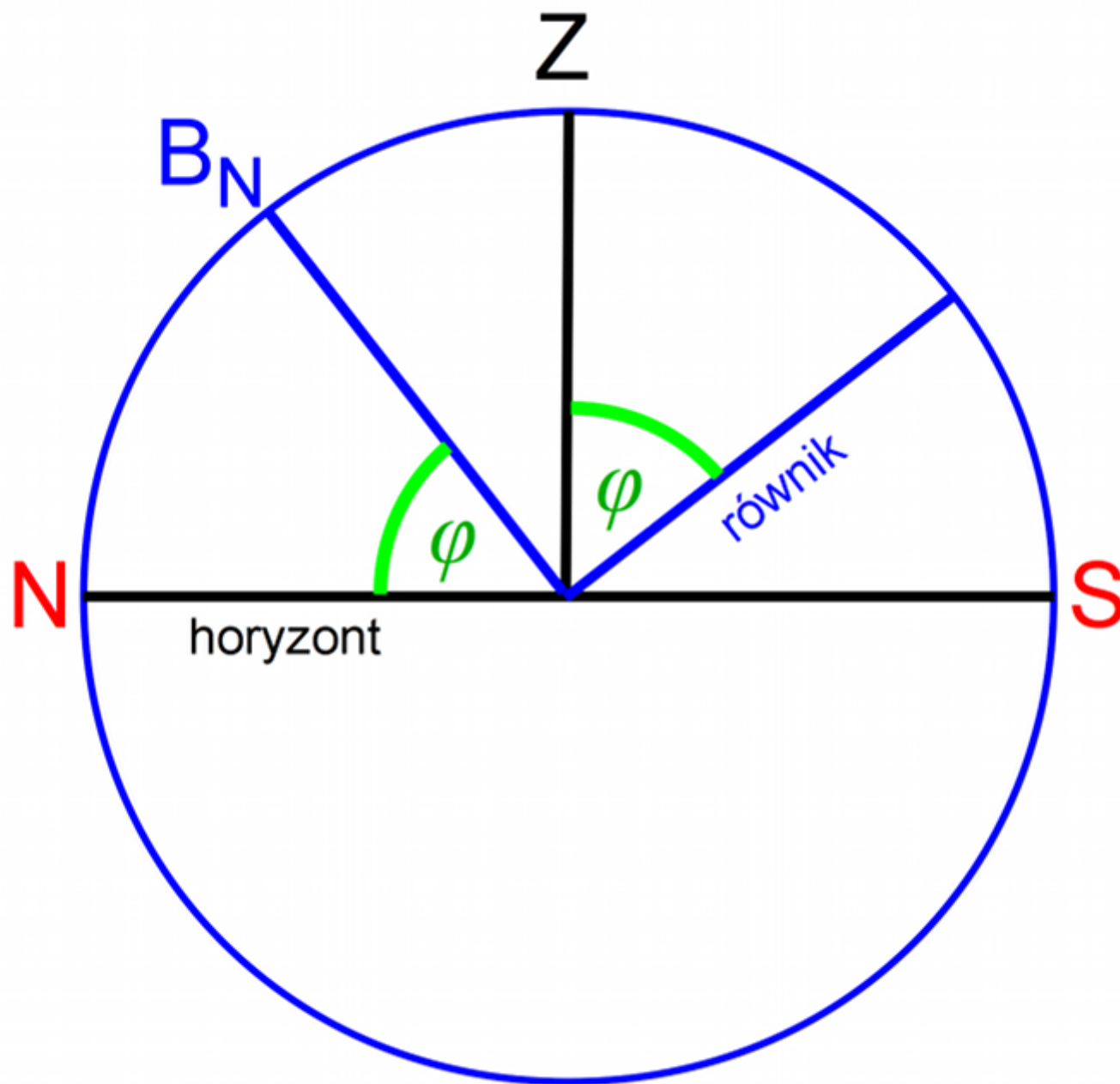




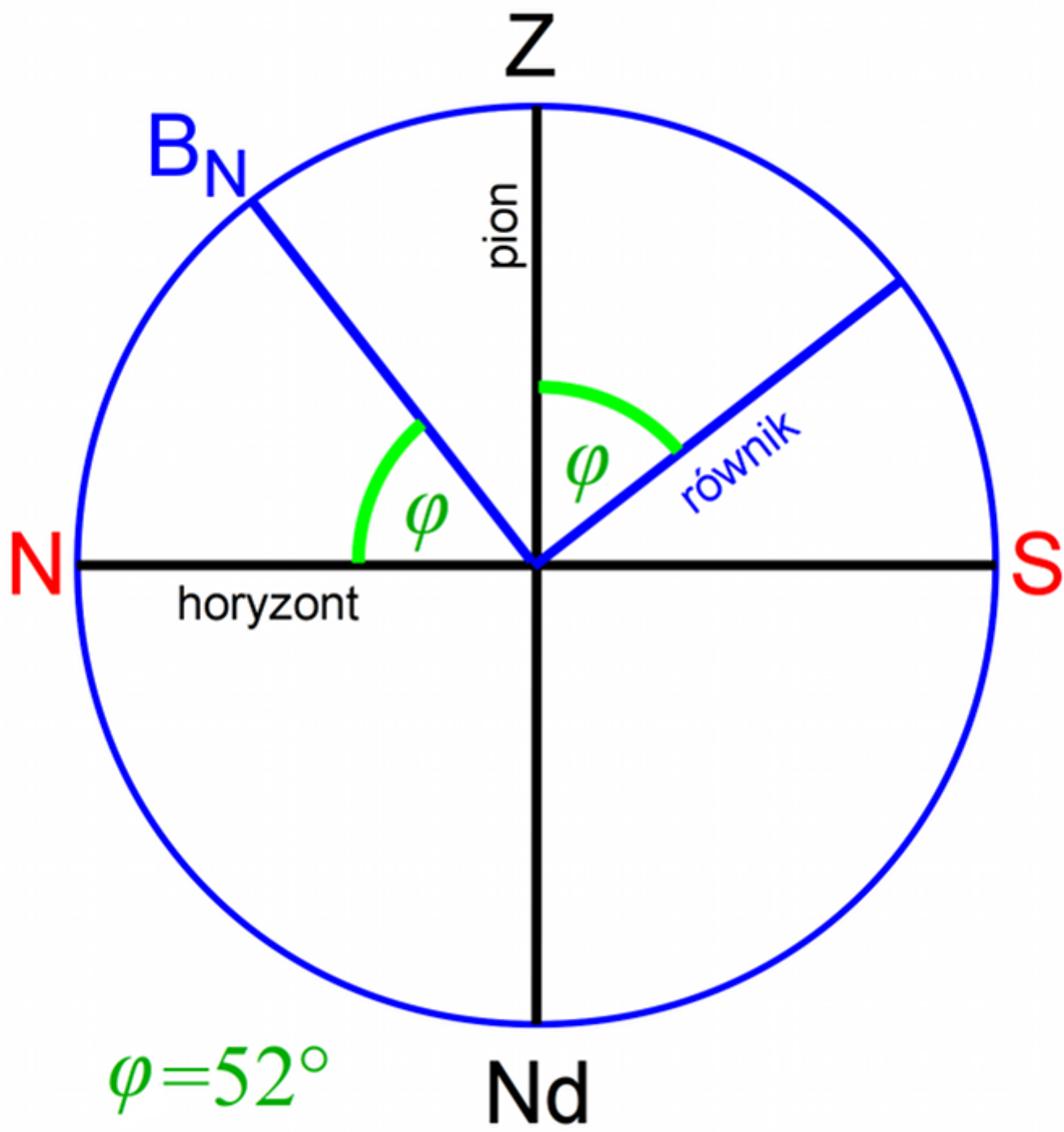


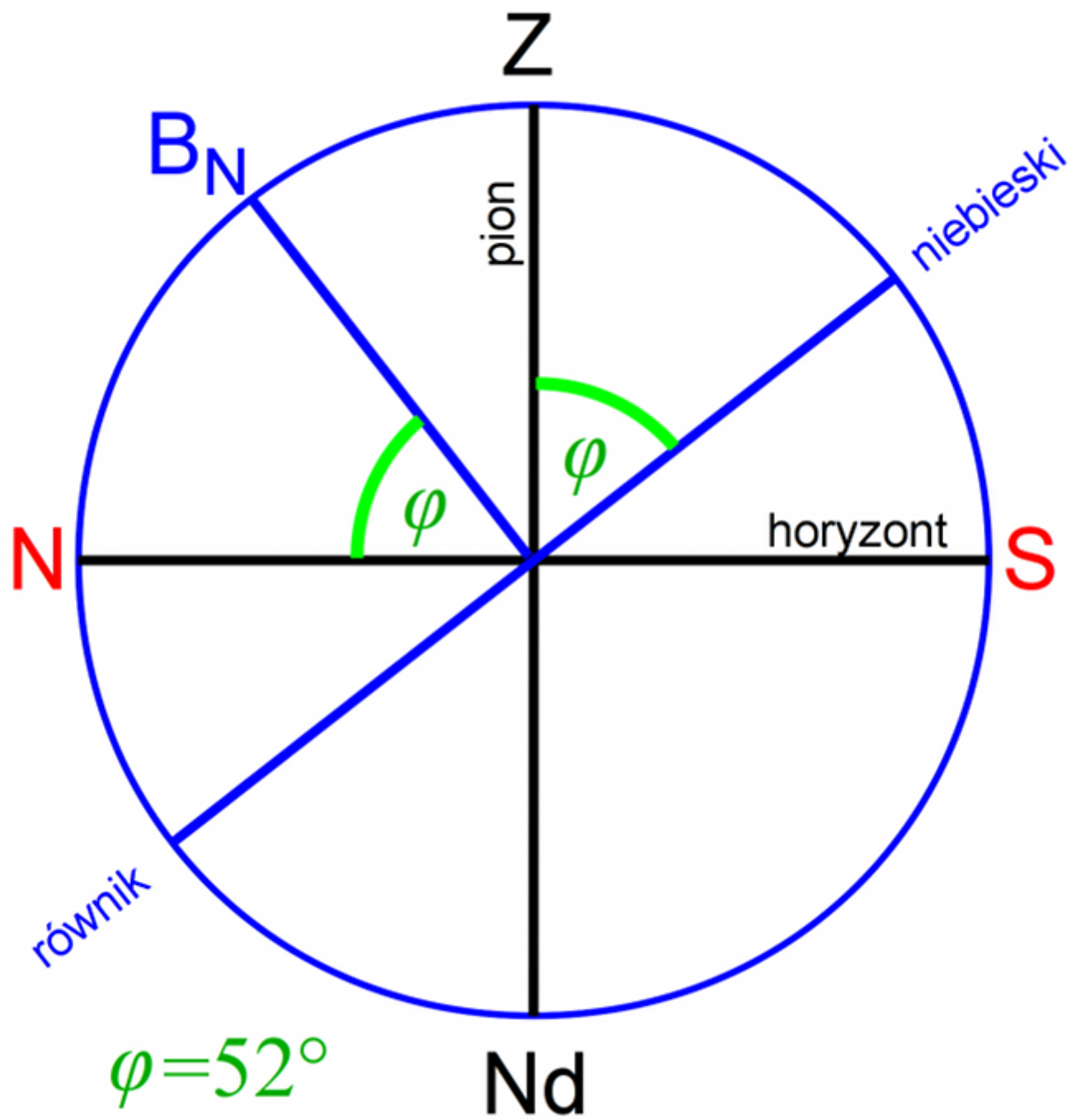


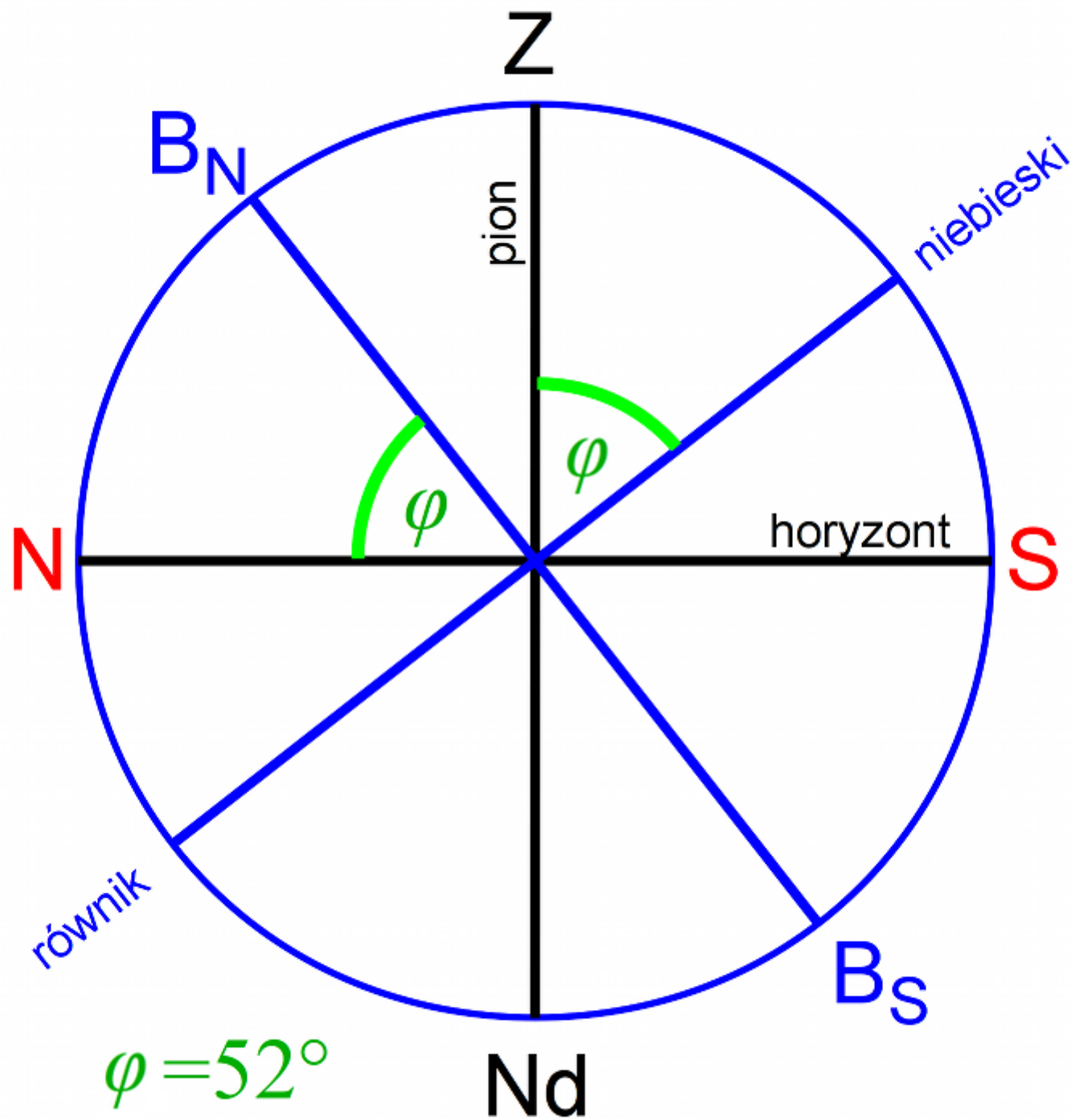
$$\varphi = 52^\circ$$

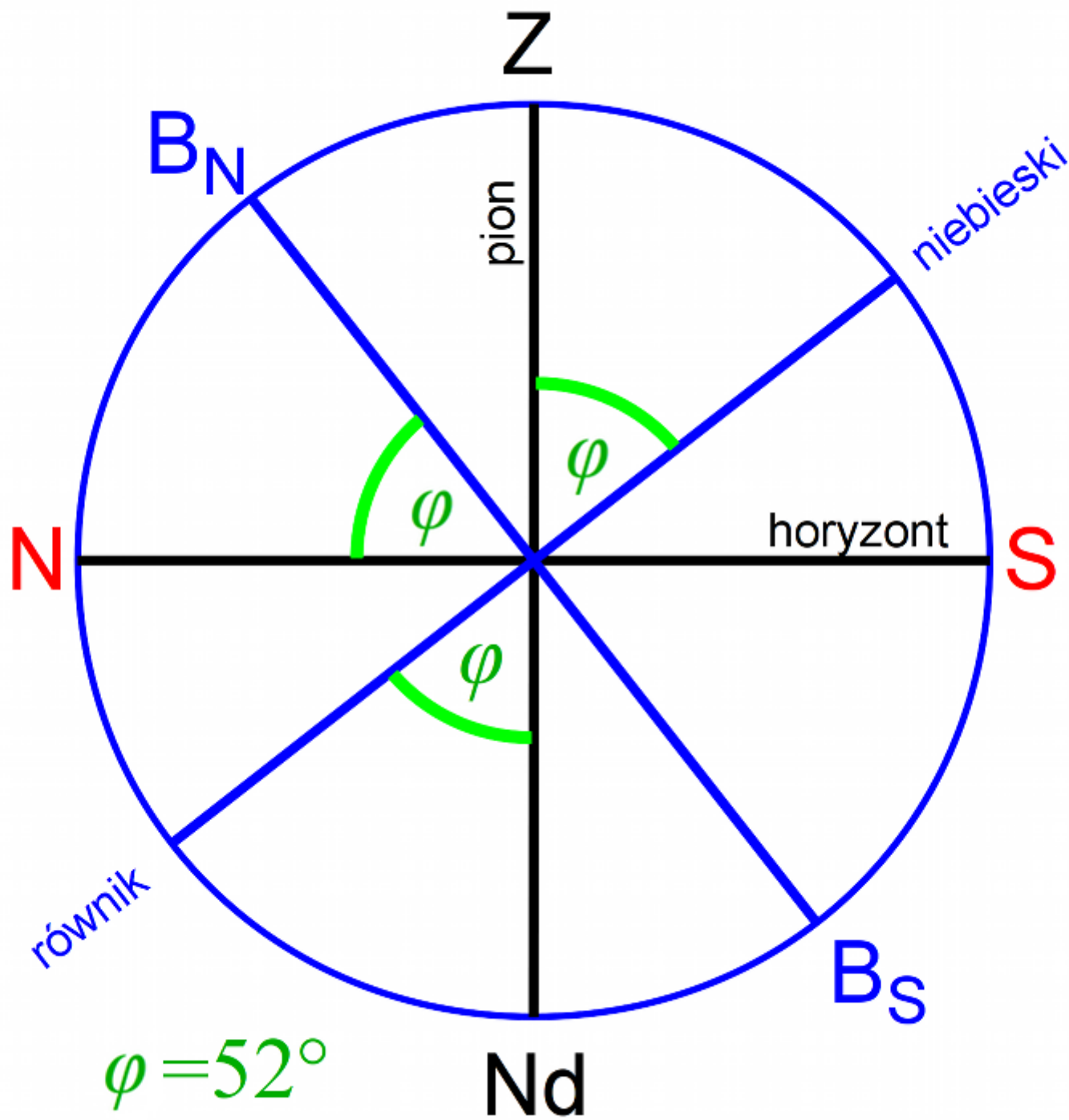


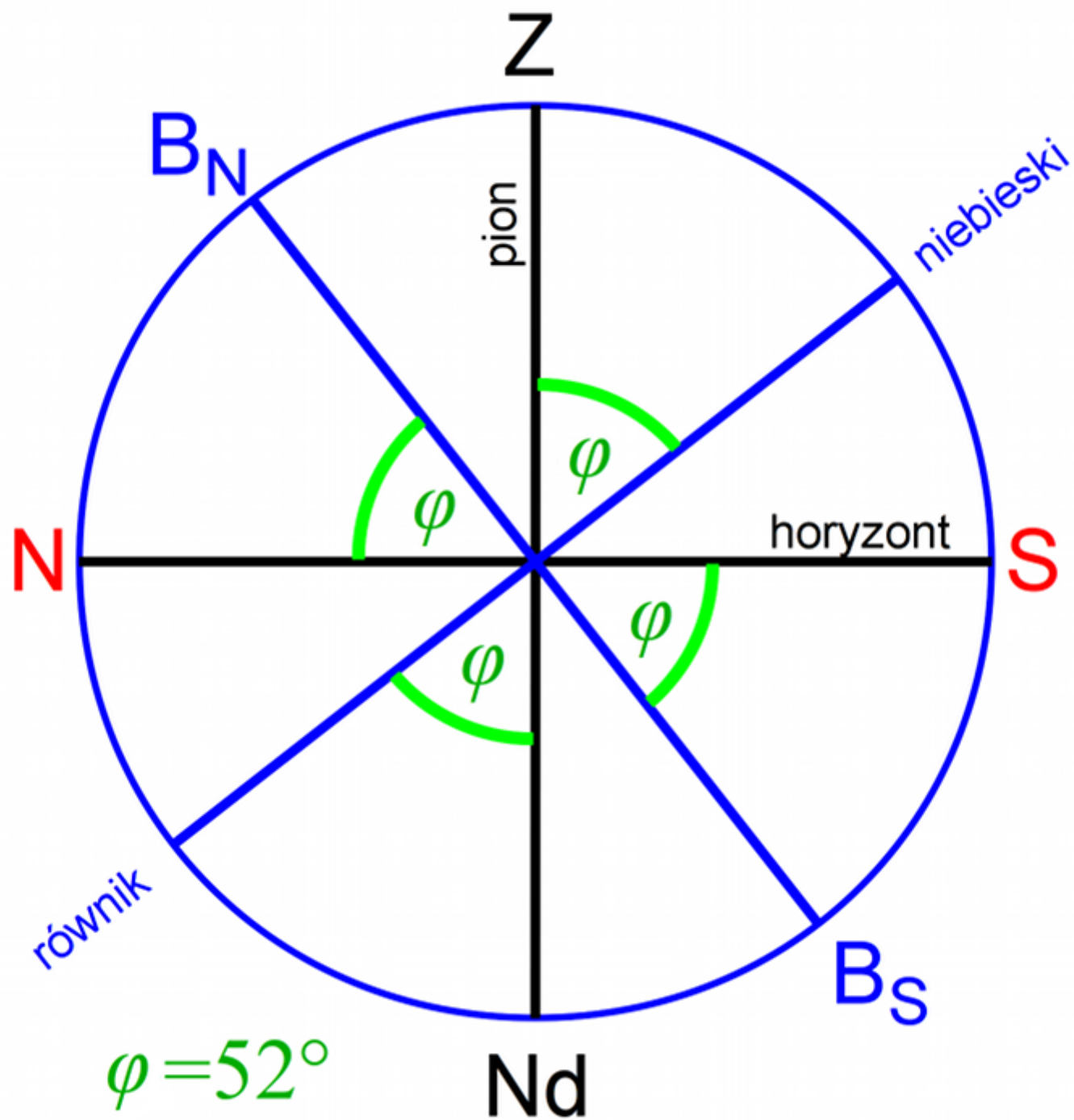
$$\varphi = 52^\circ$$

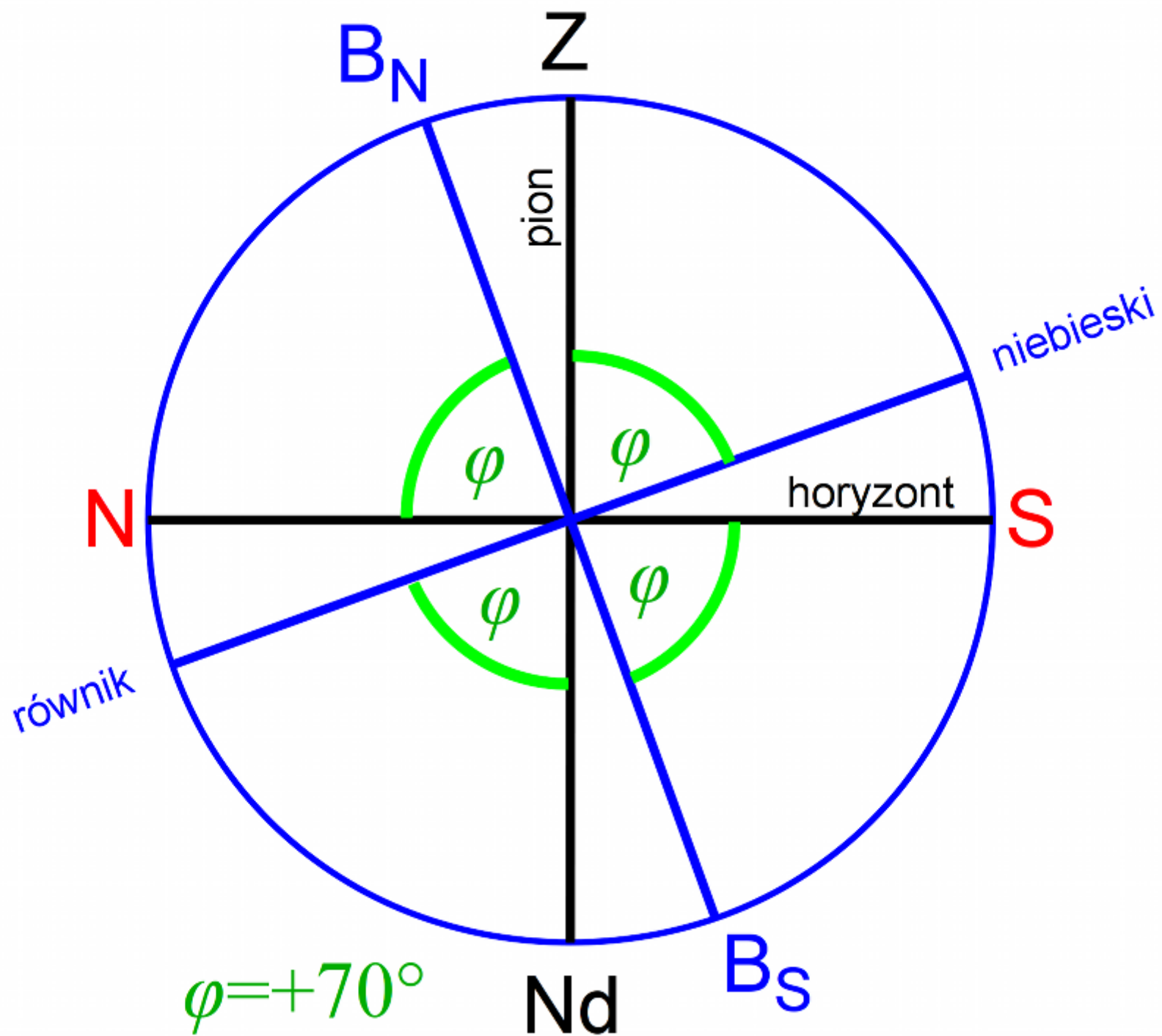


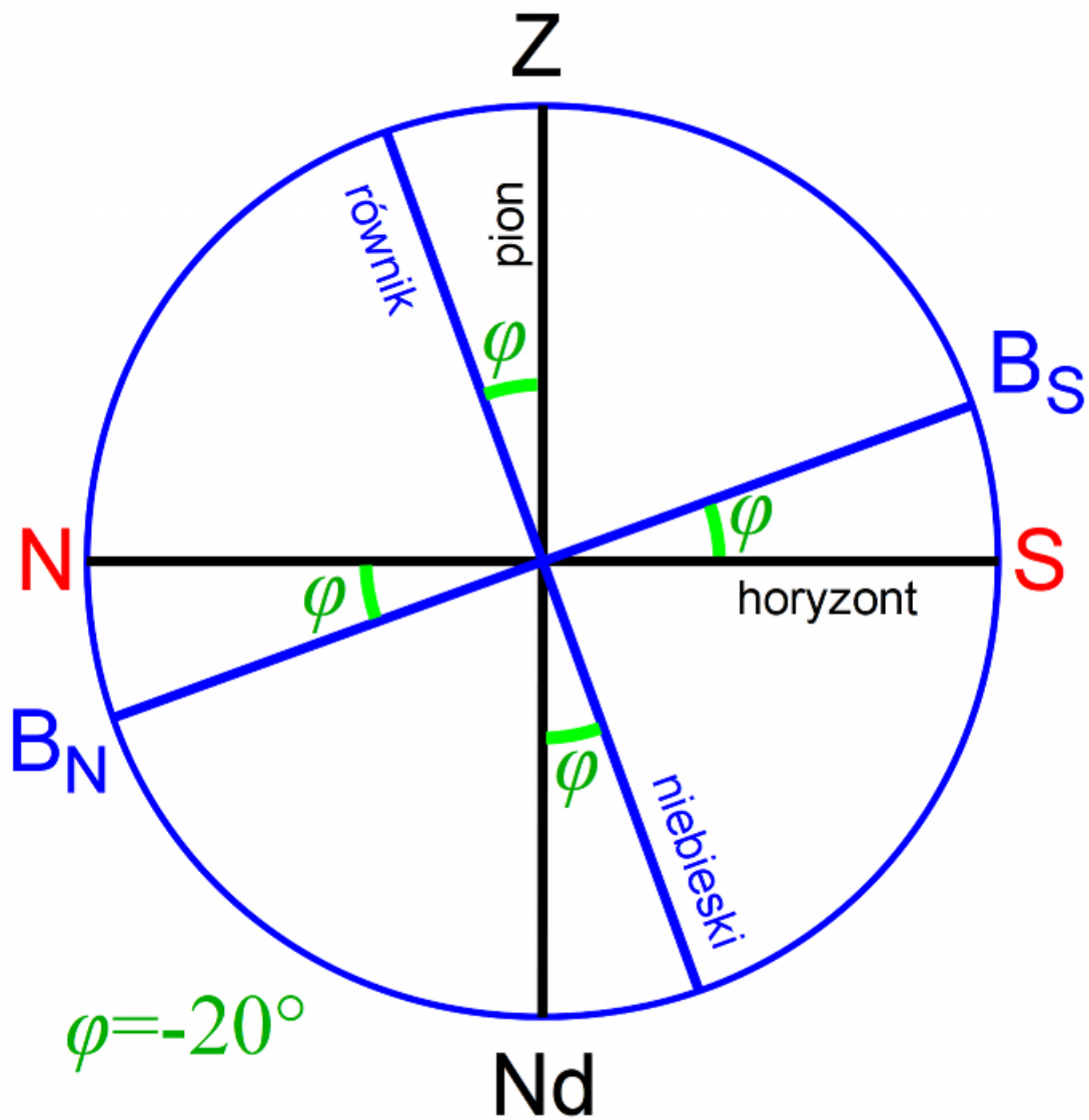




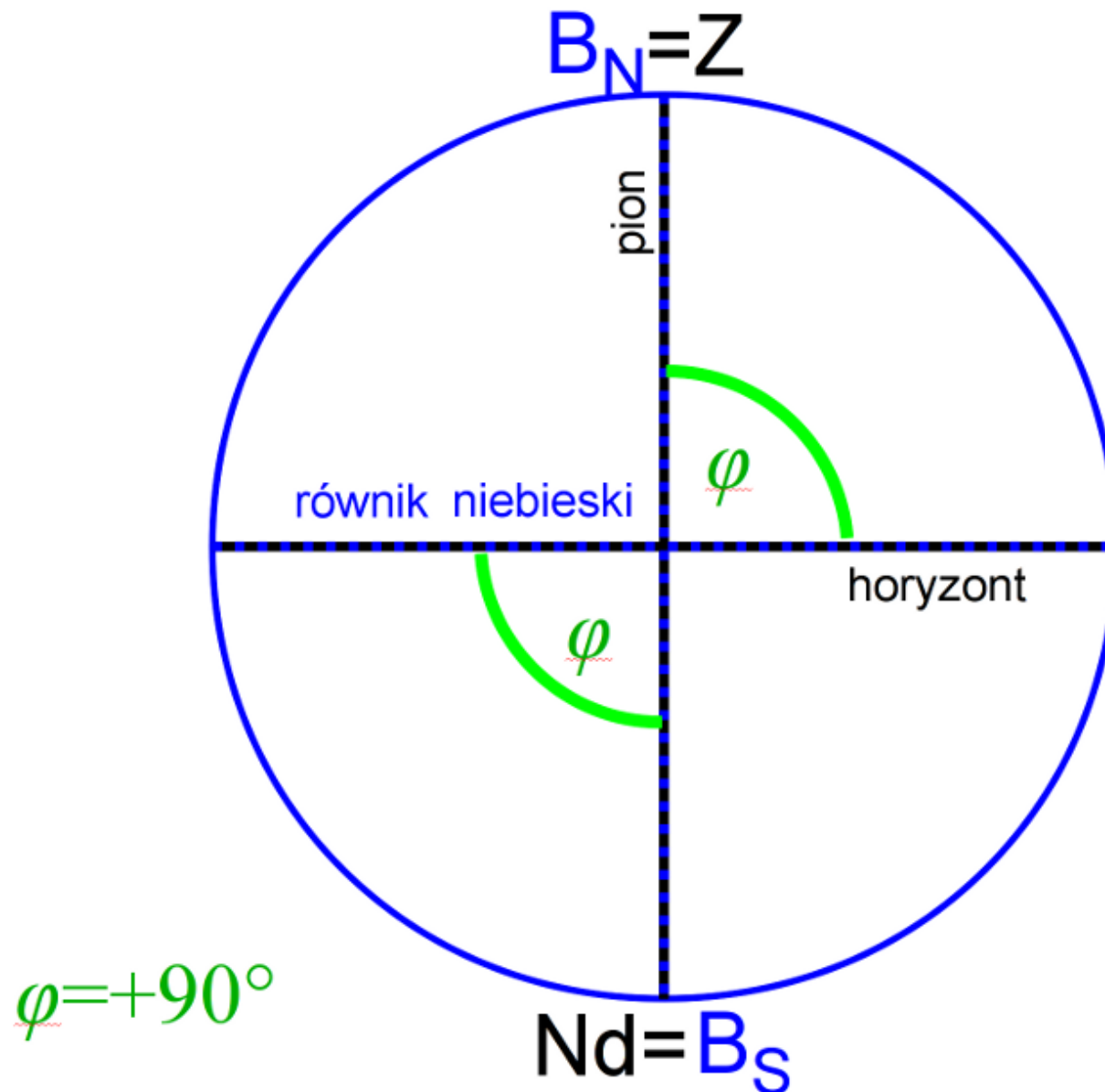




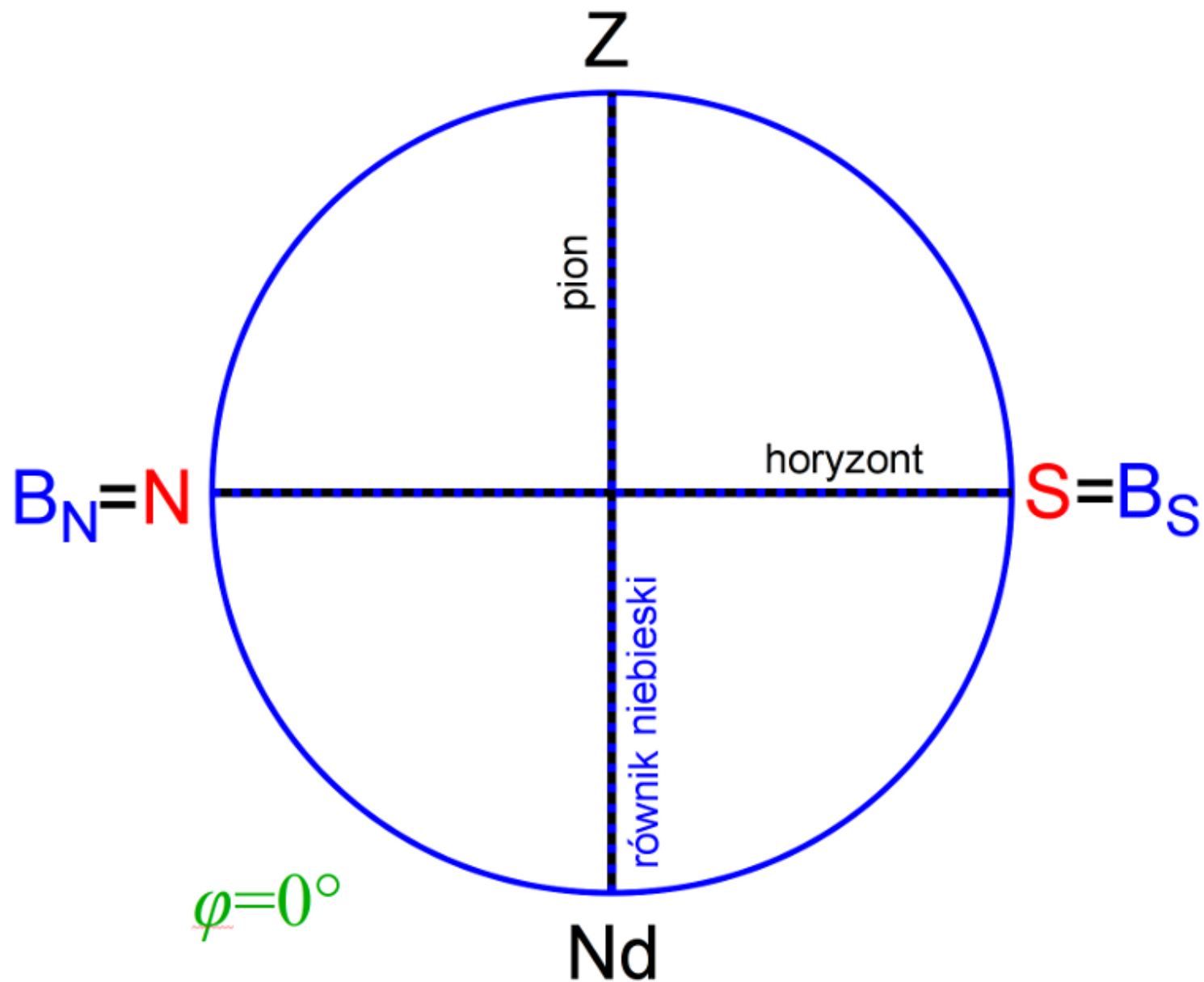


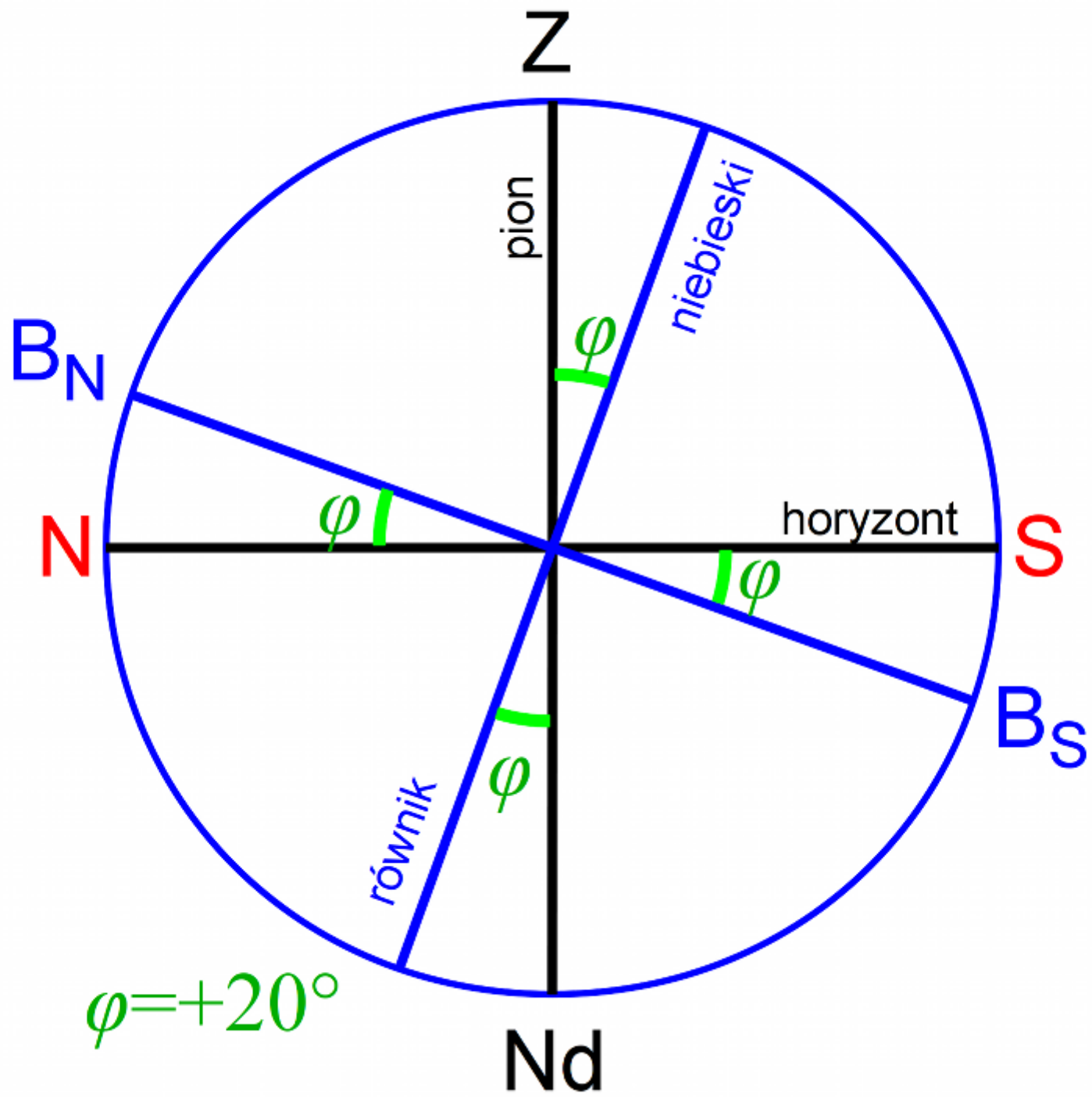


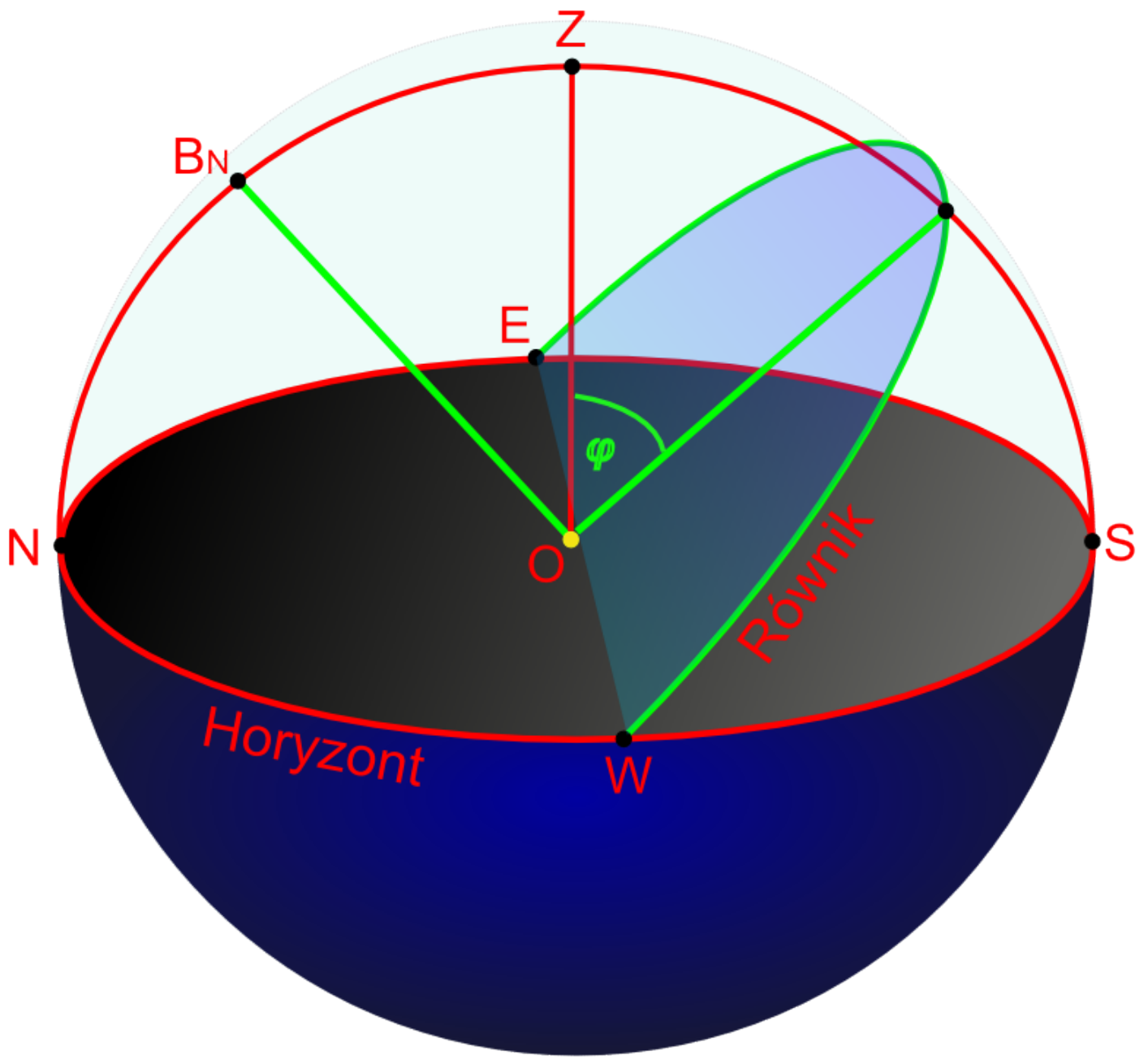
Na biegunie północnym...



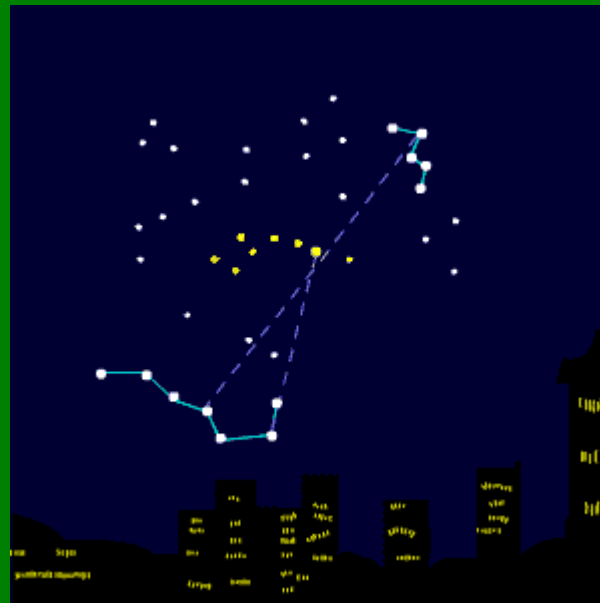
Na równiku ...







Ruch dobowy sfery niebieskiej



by Mjchael



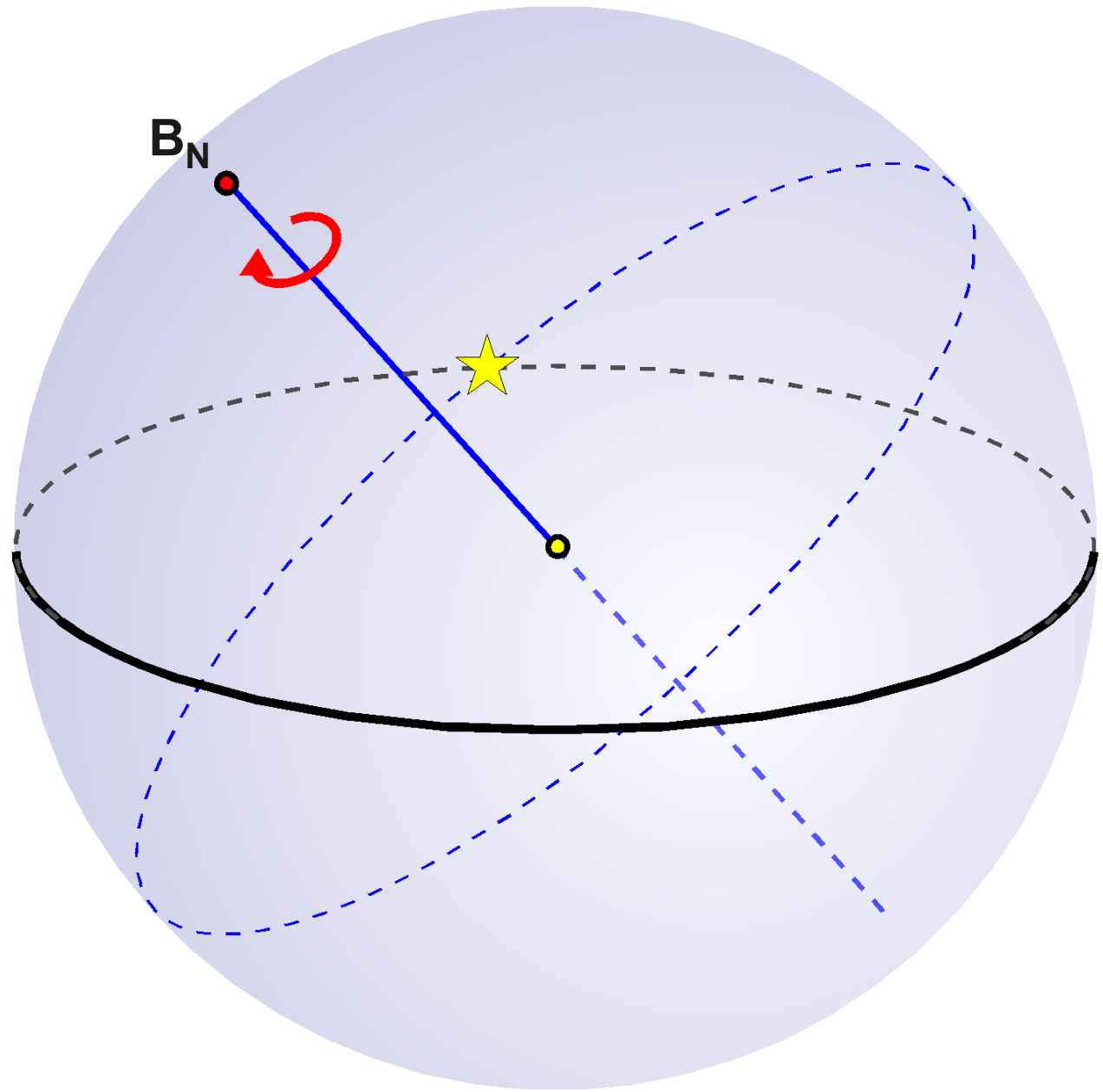
Photo by: Selim S.

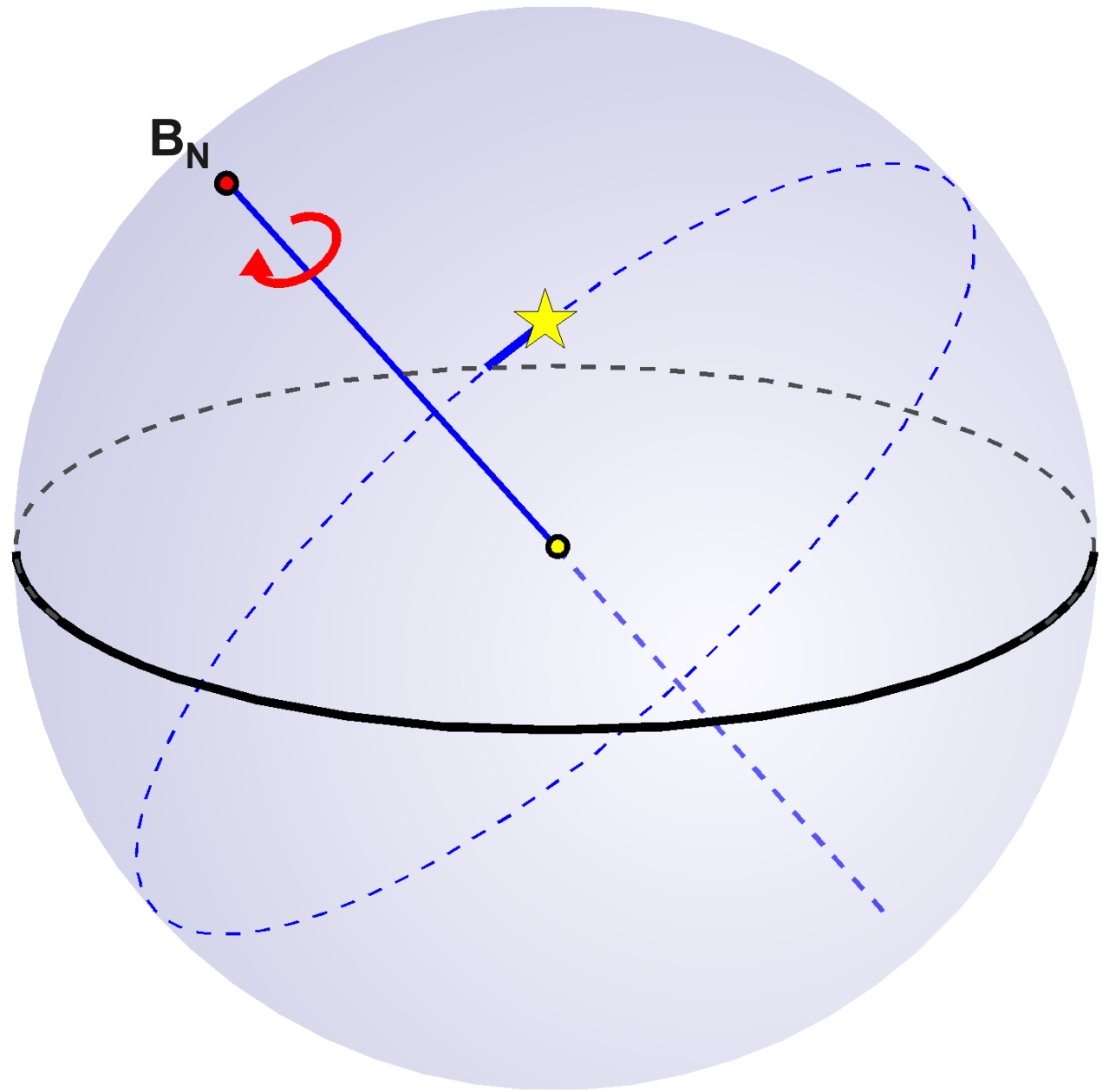


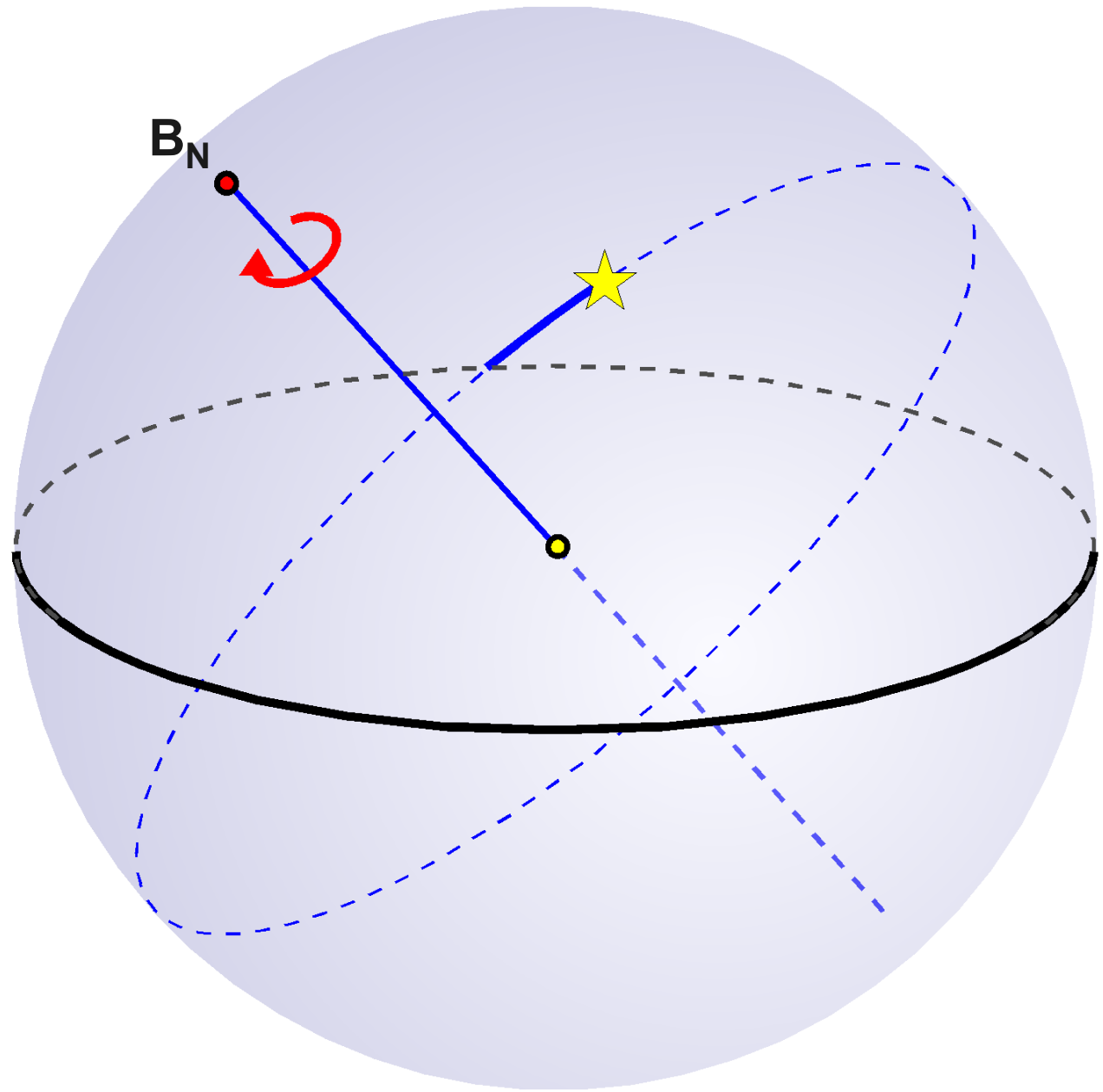
Mt Hamilton, Lick Observatory, by Ikluft

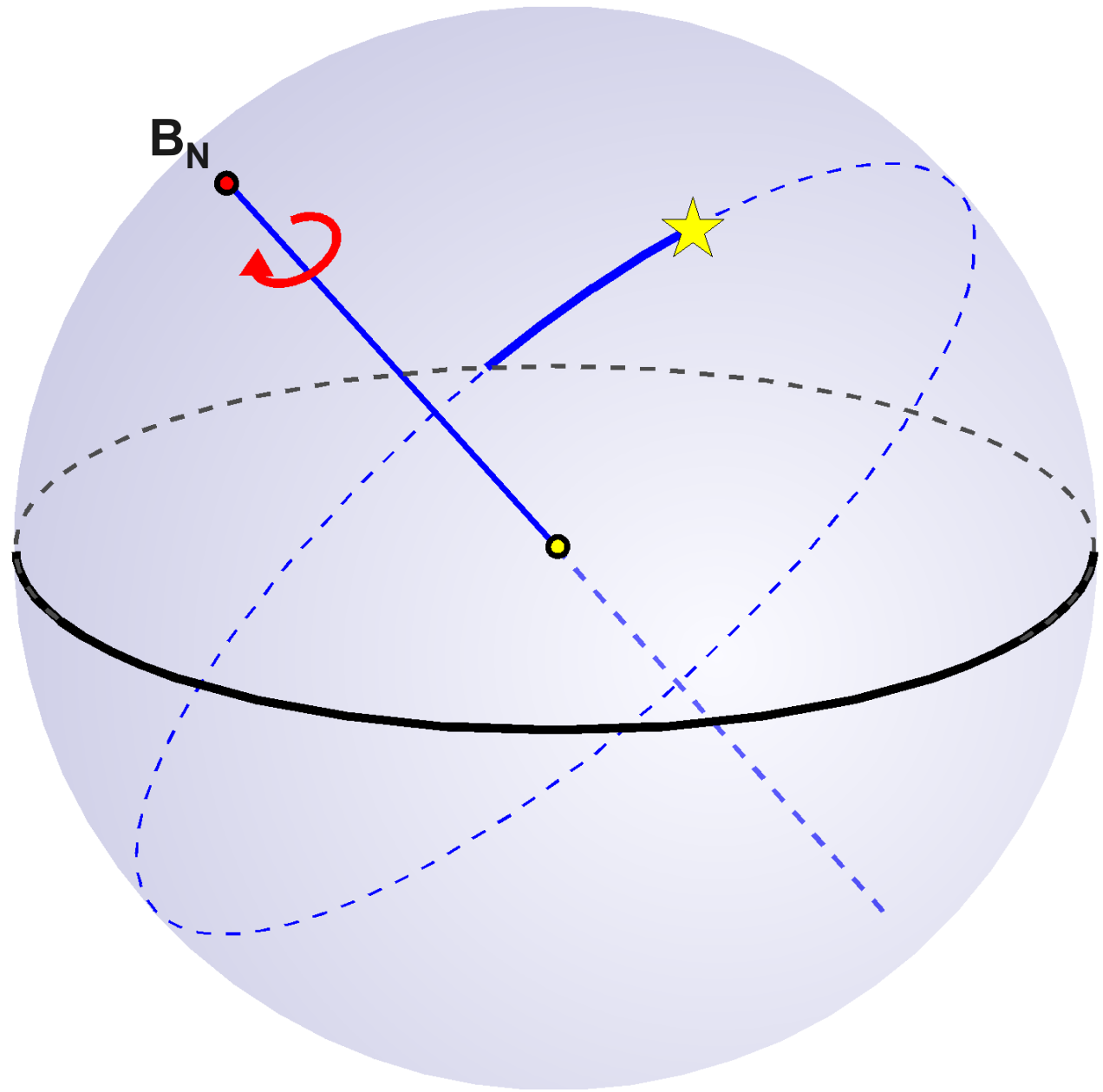
Ziemia obraca się ...

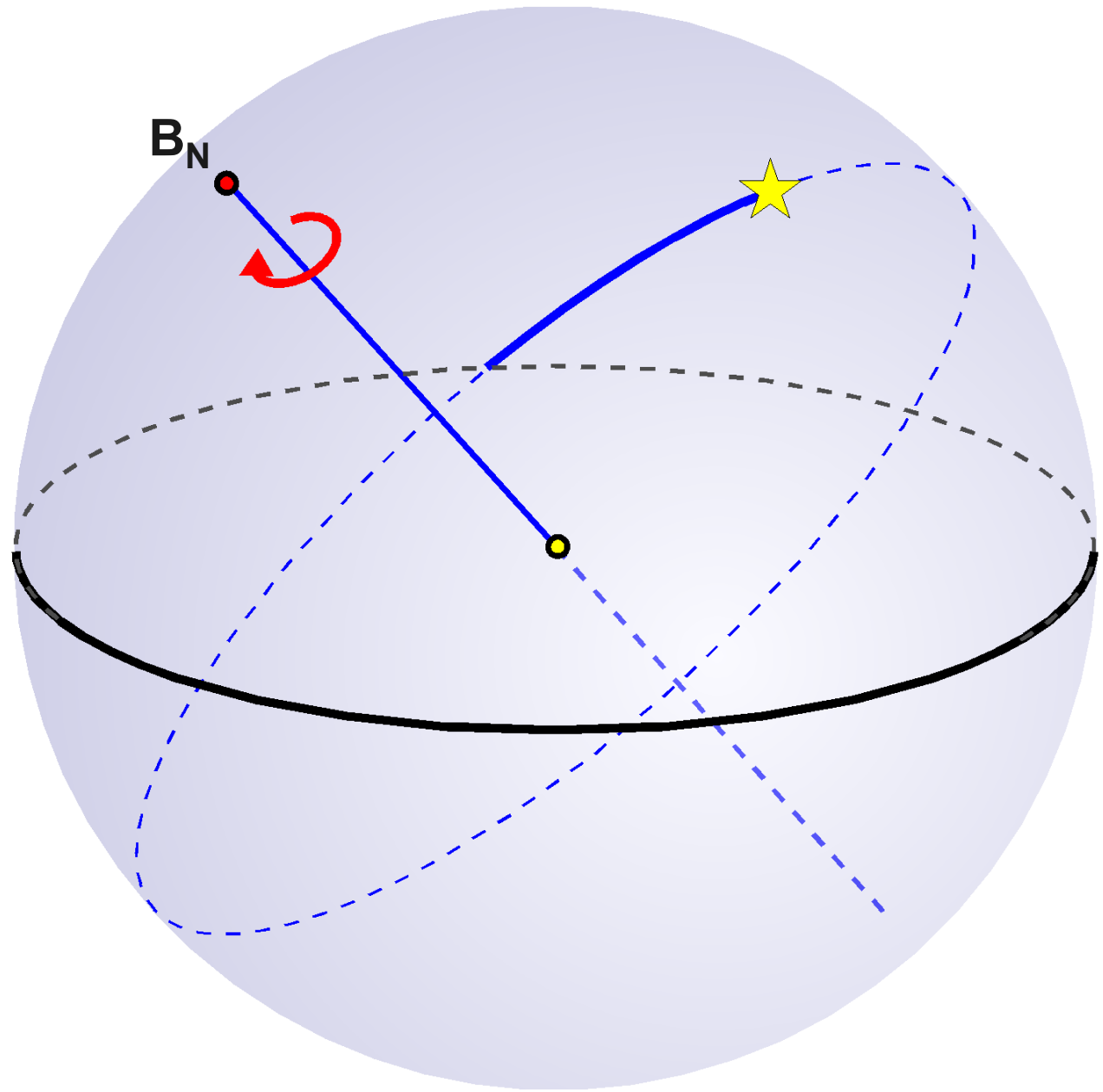


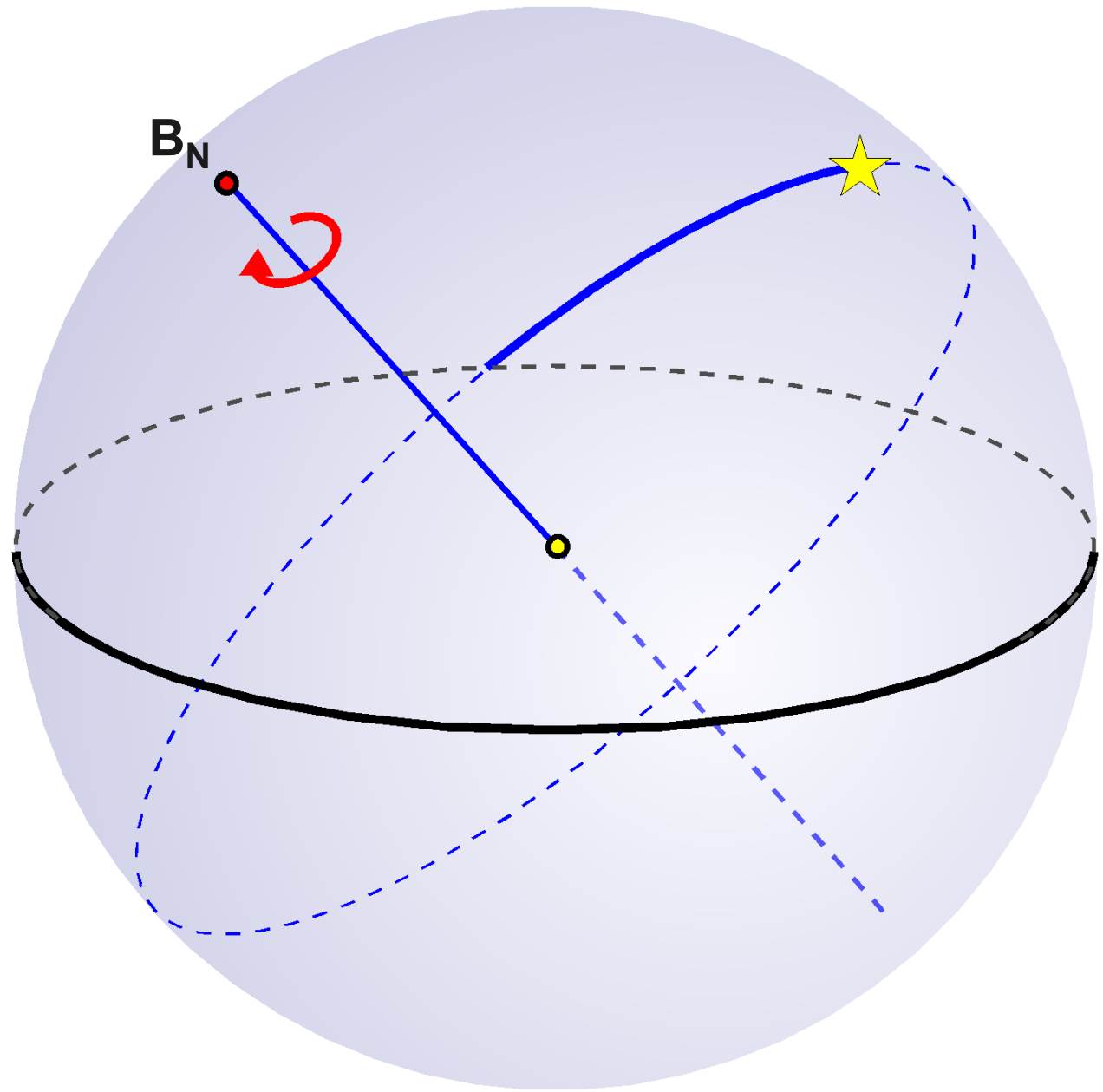




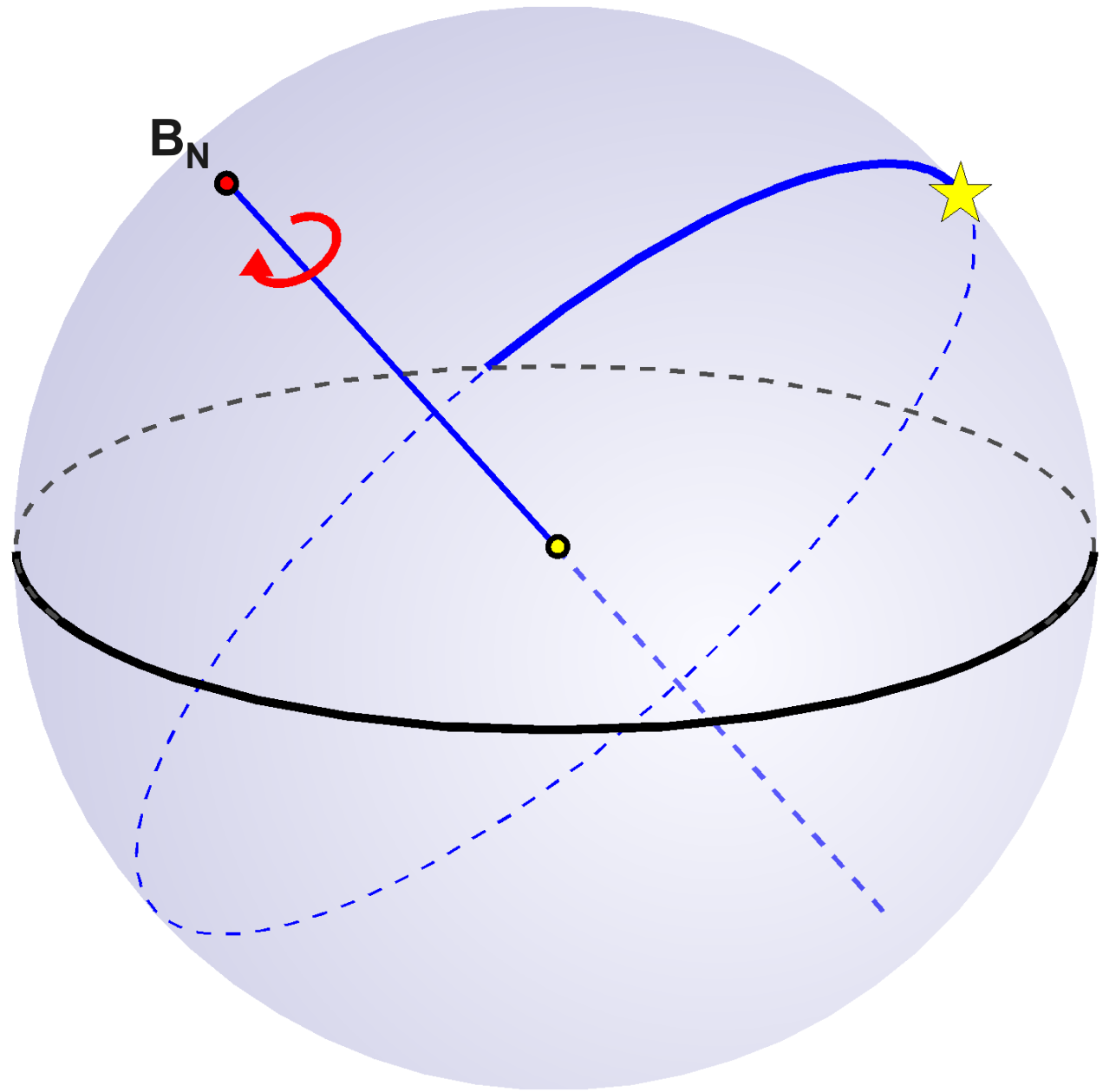


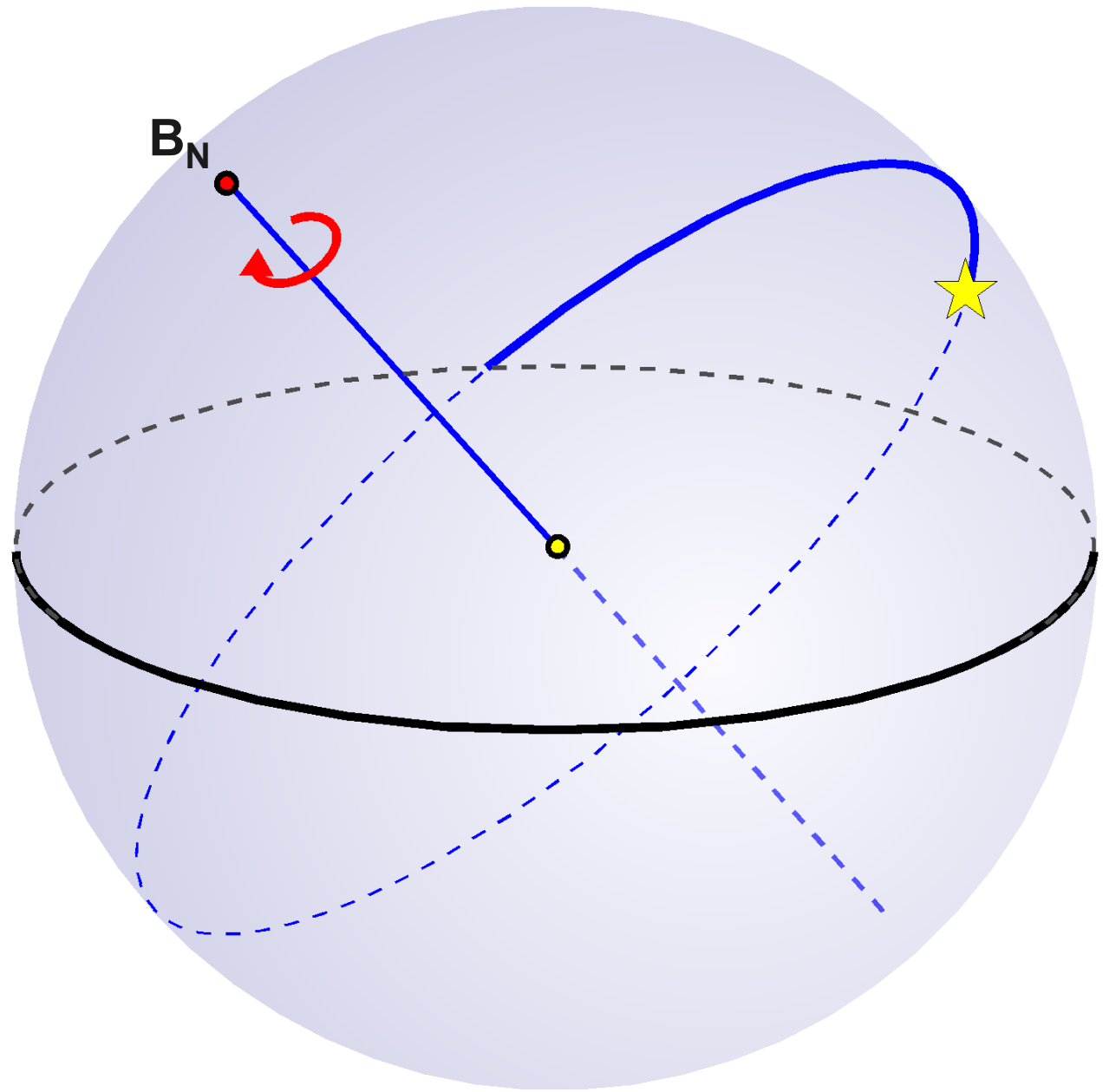


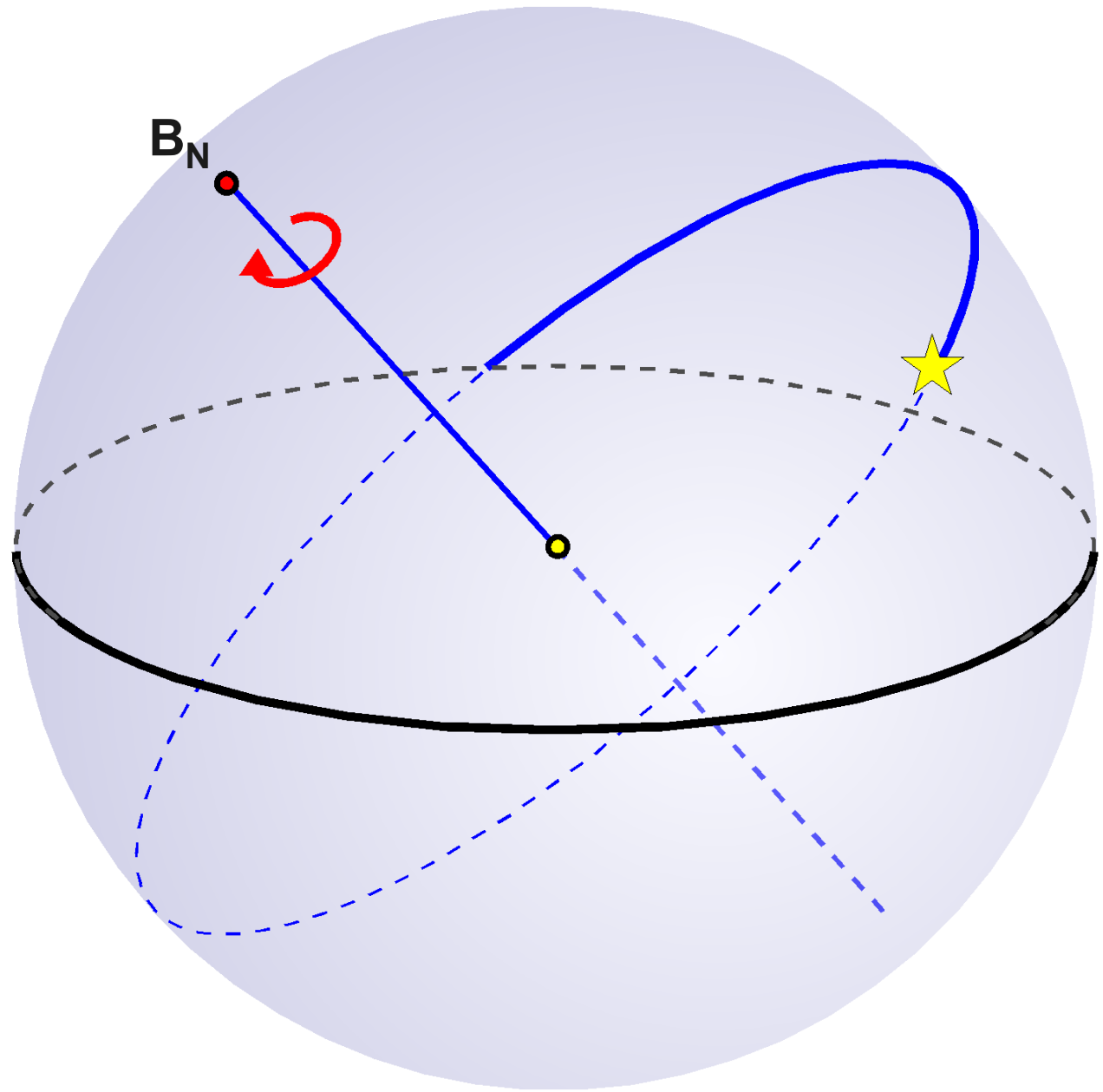


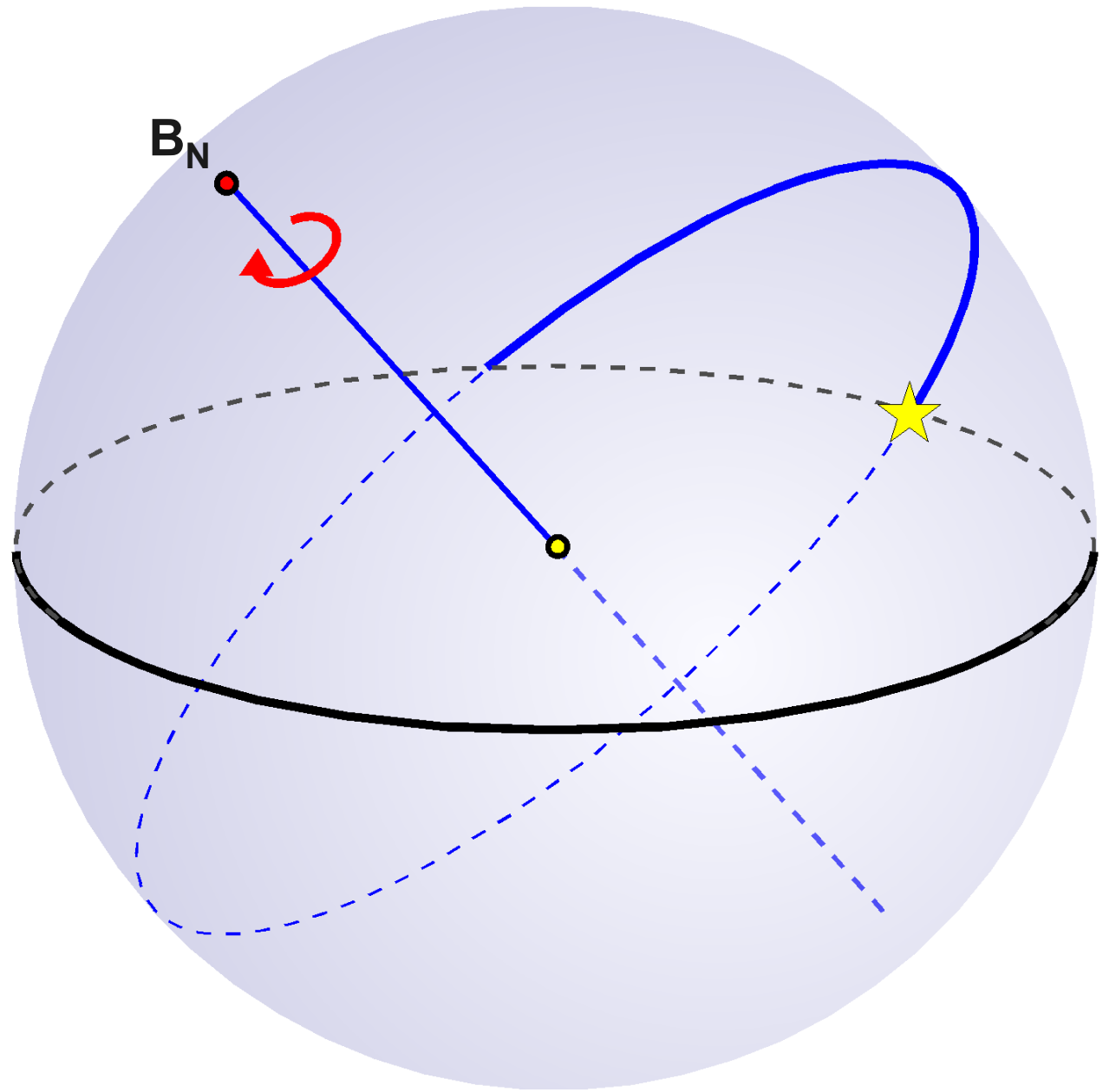


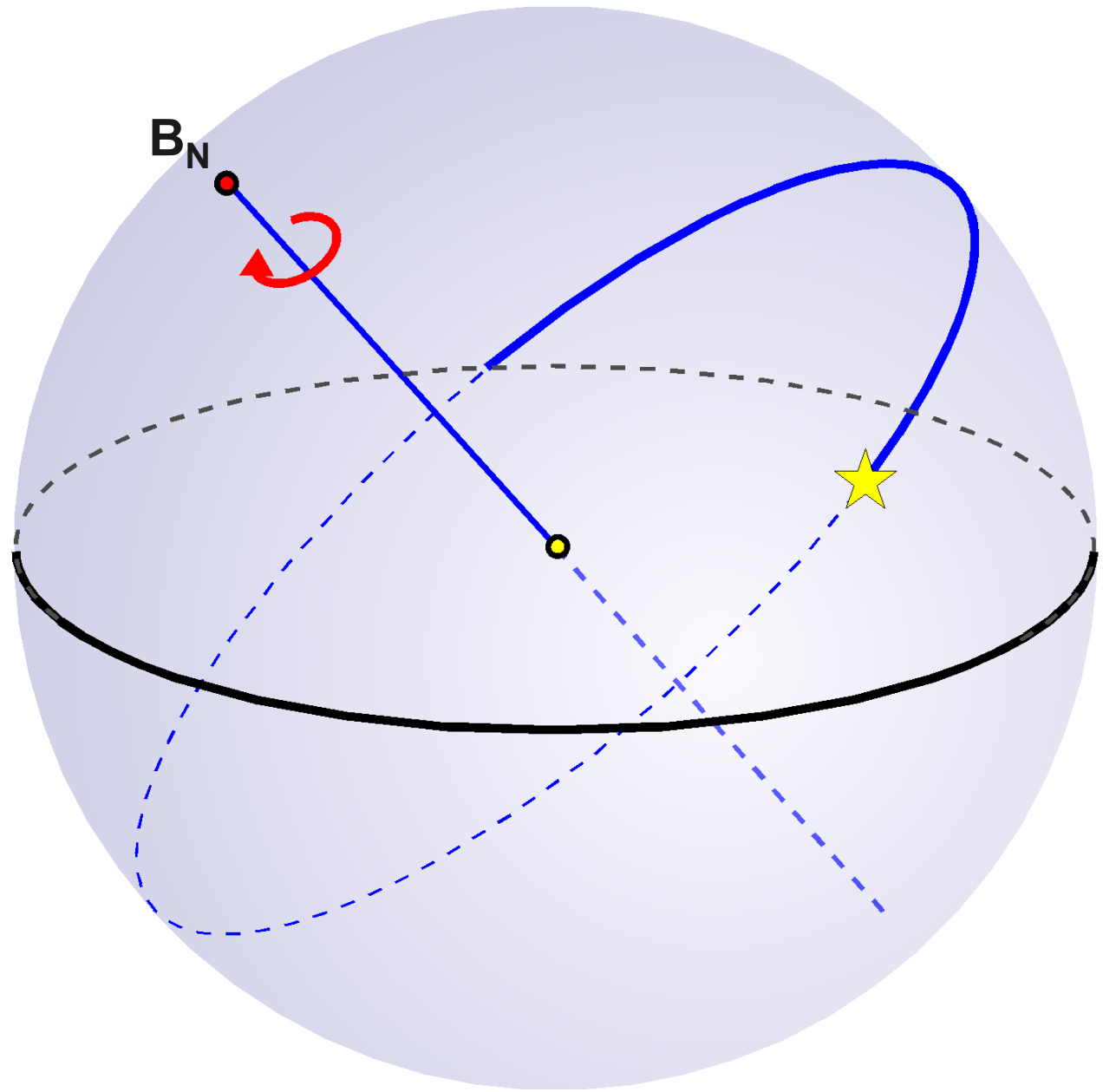
B_N

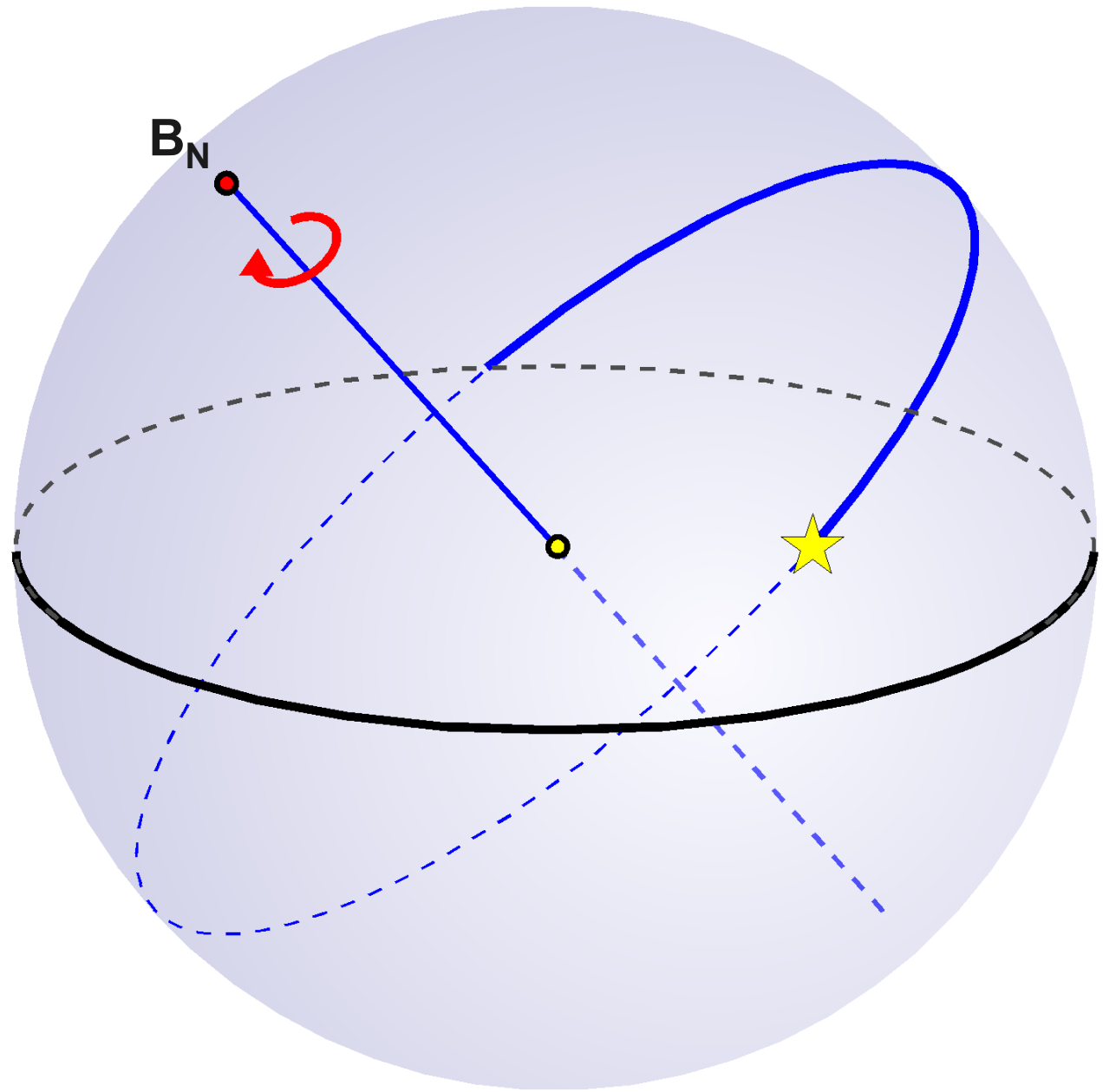


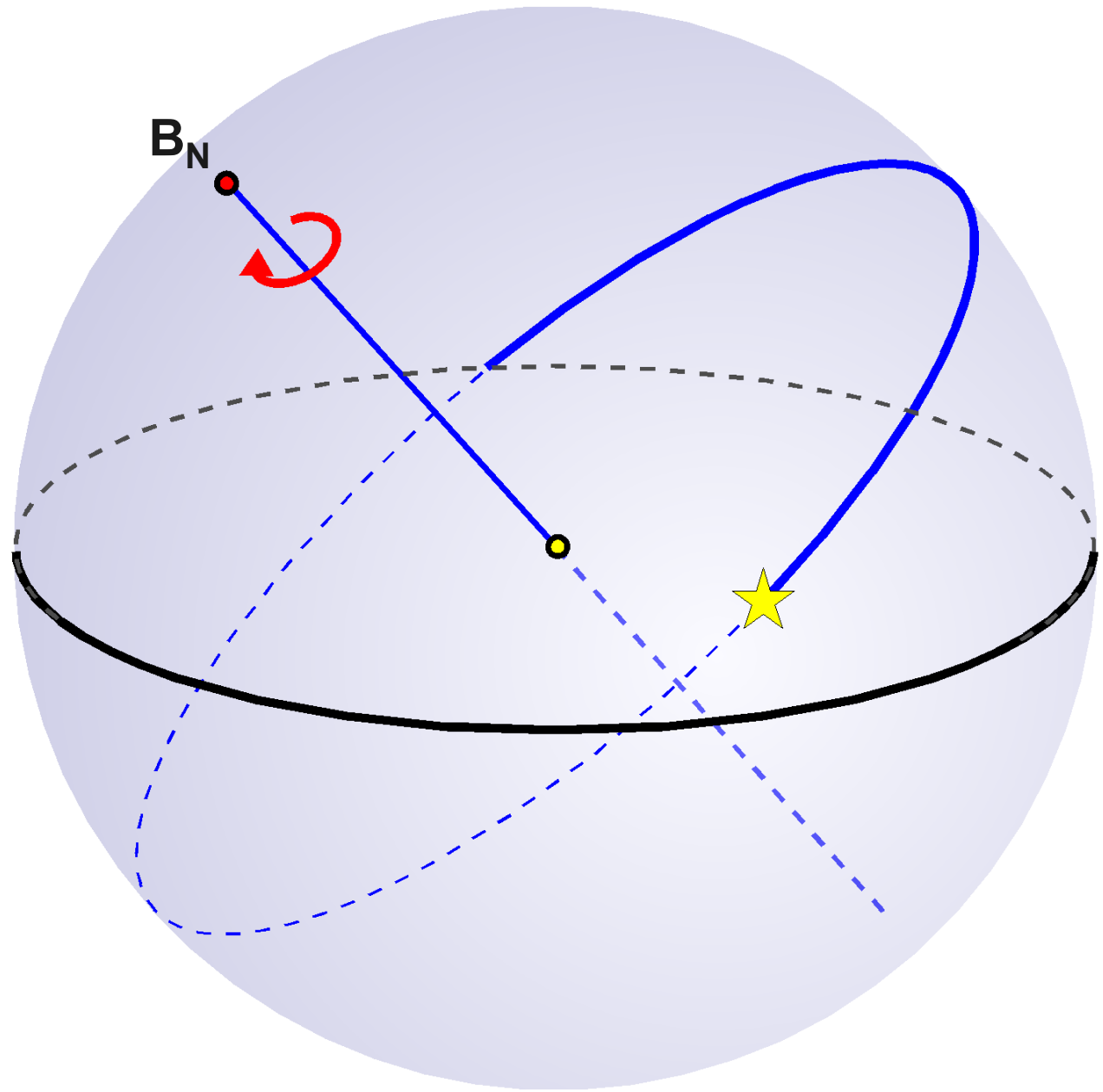


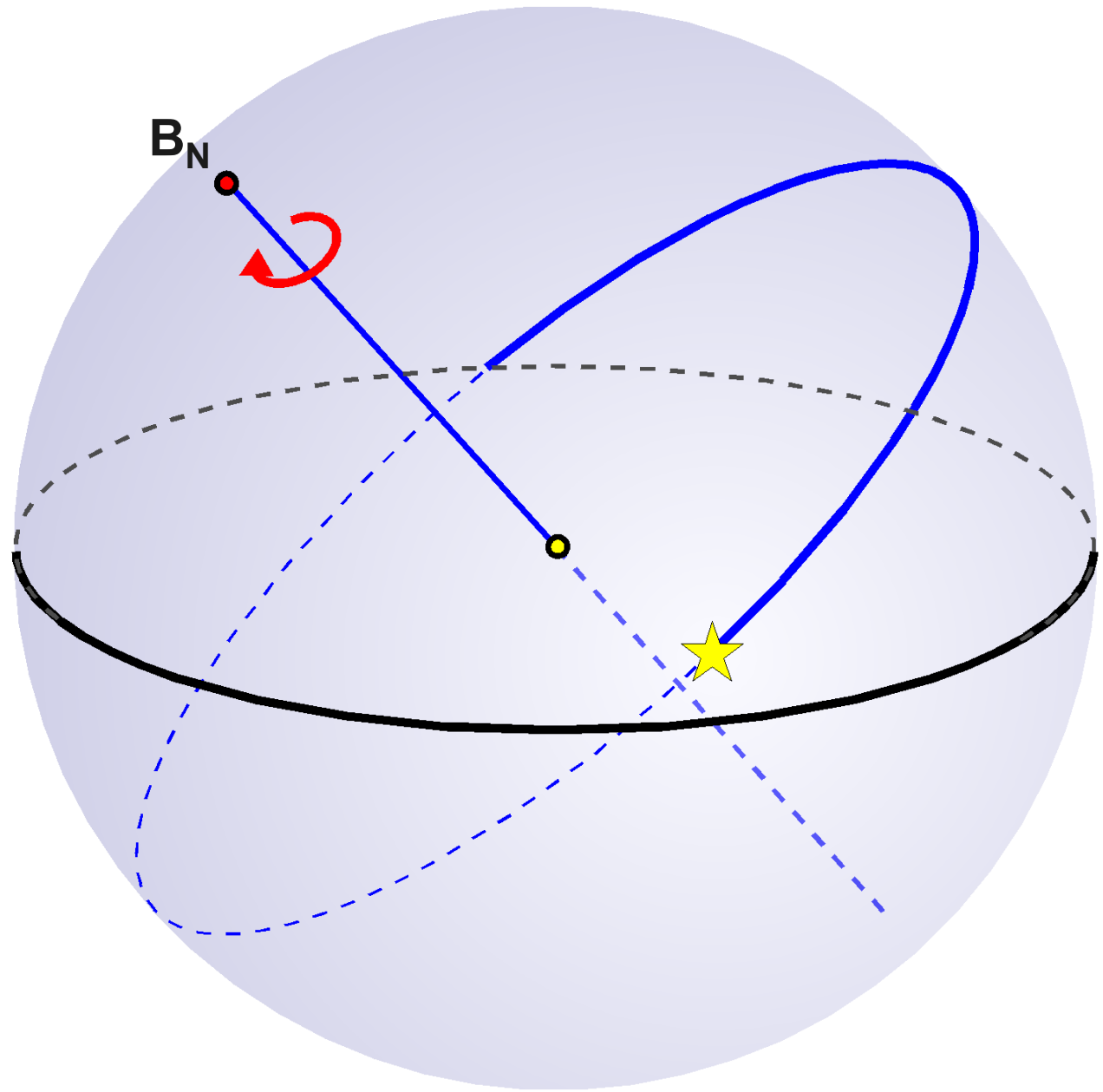


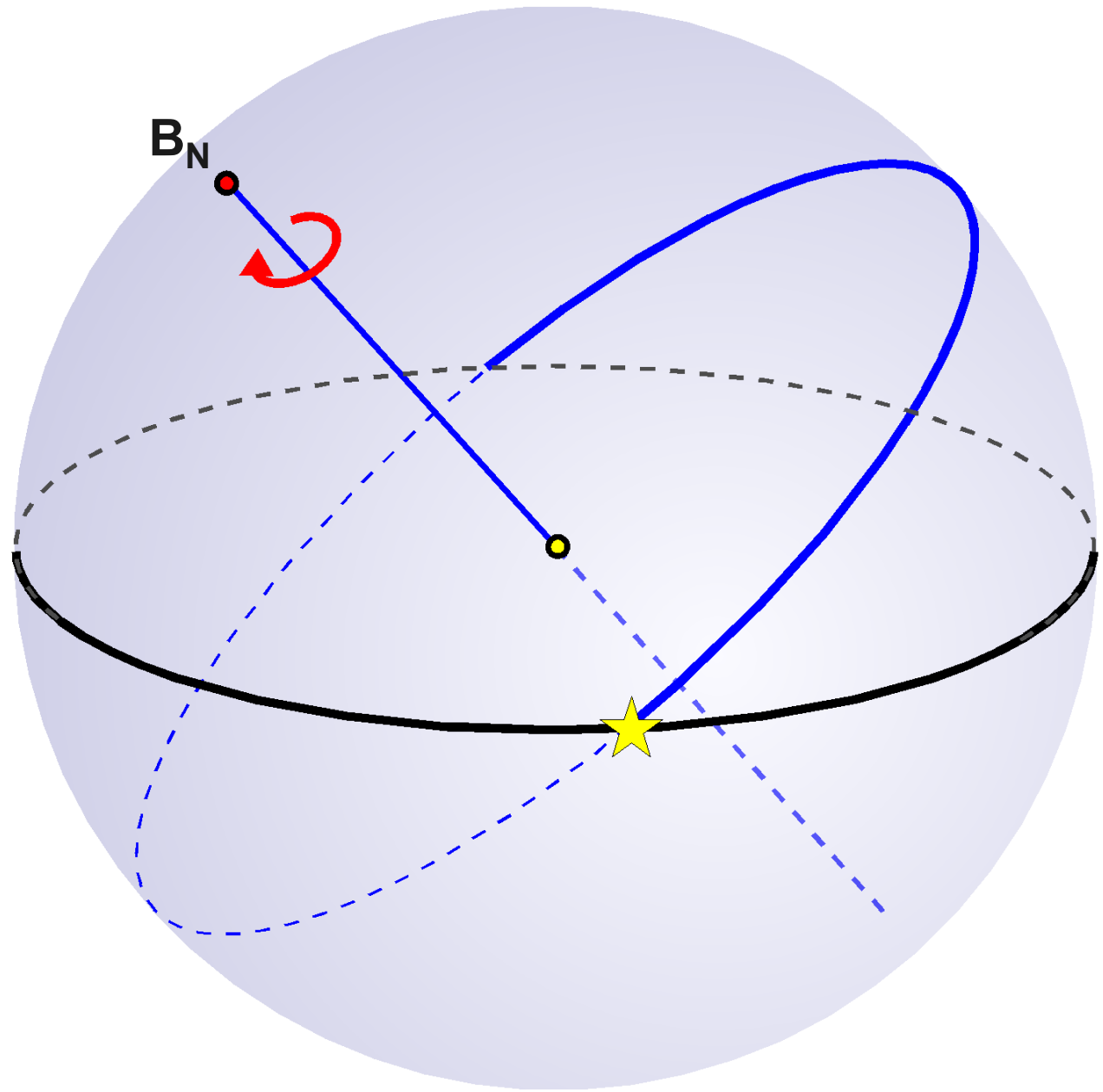


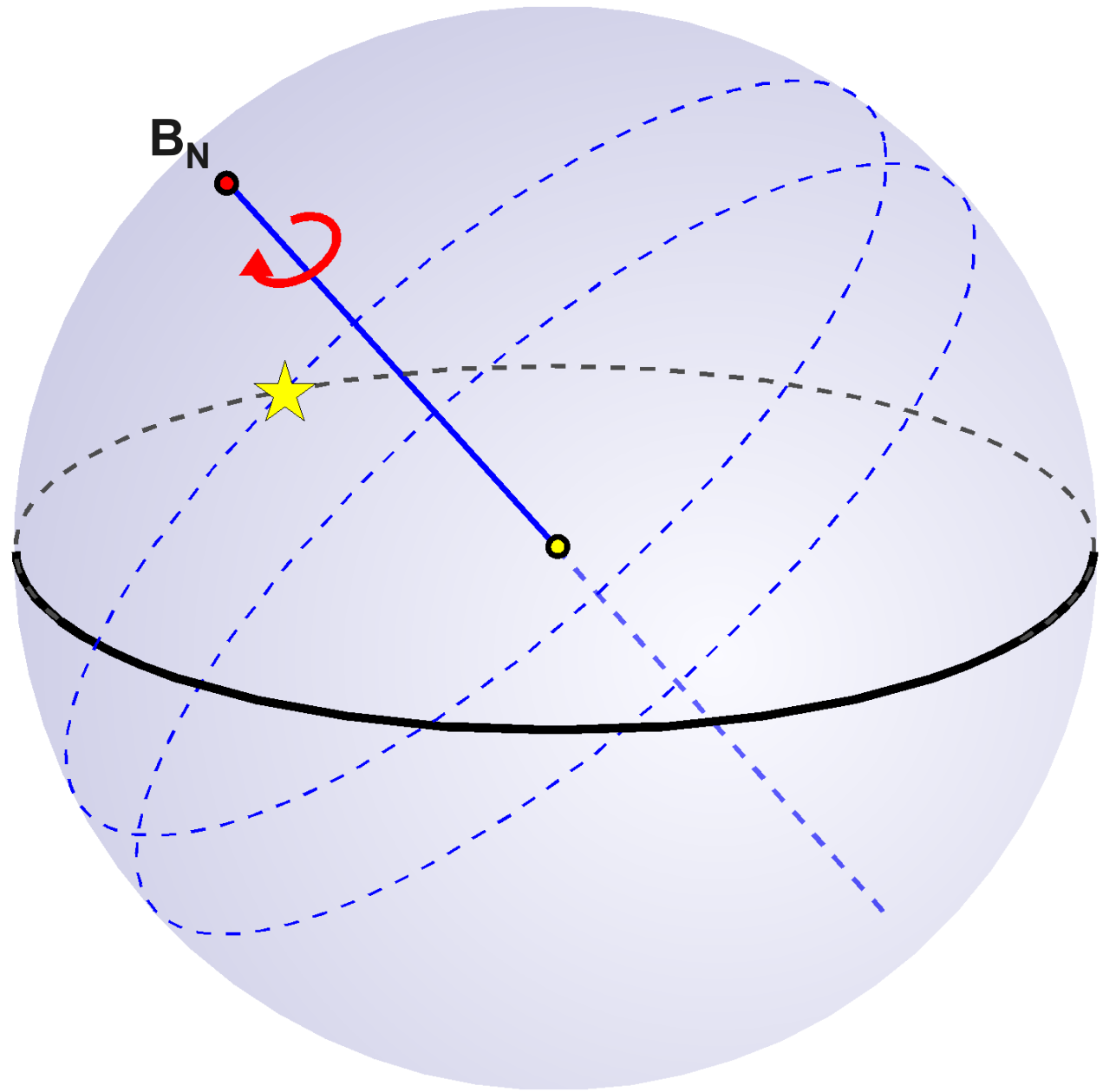


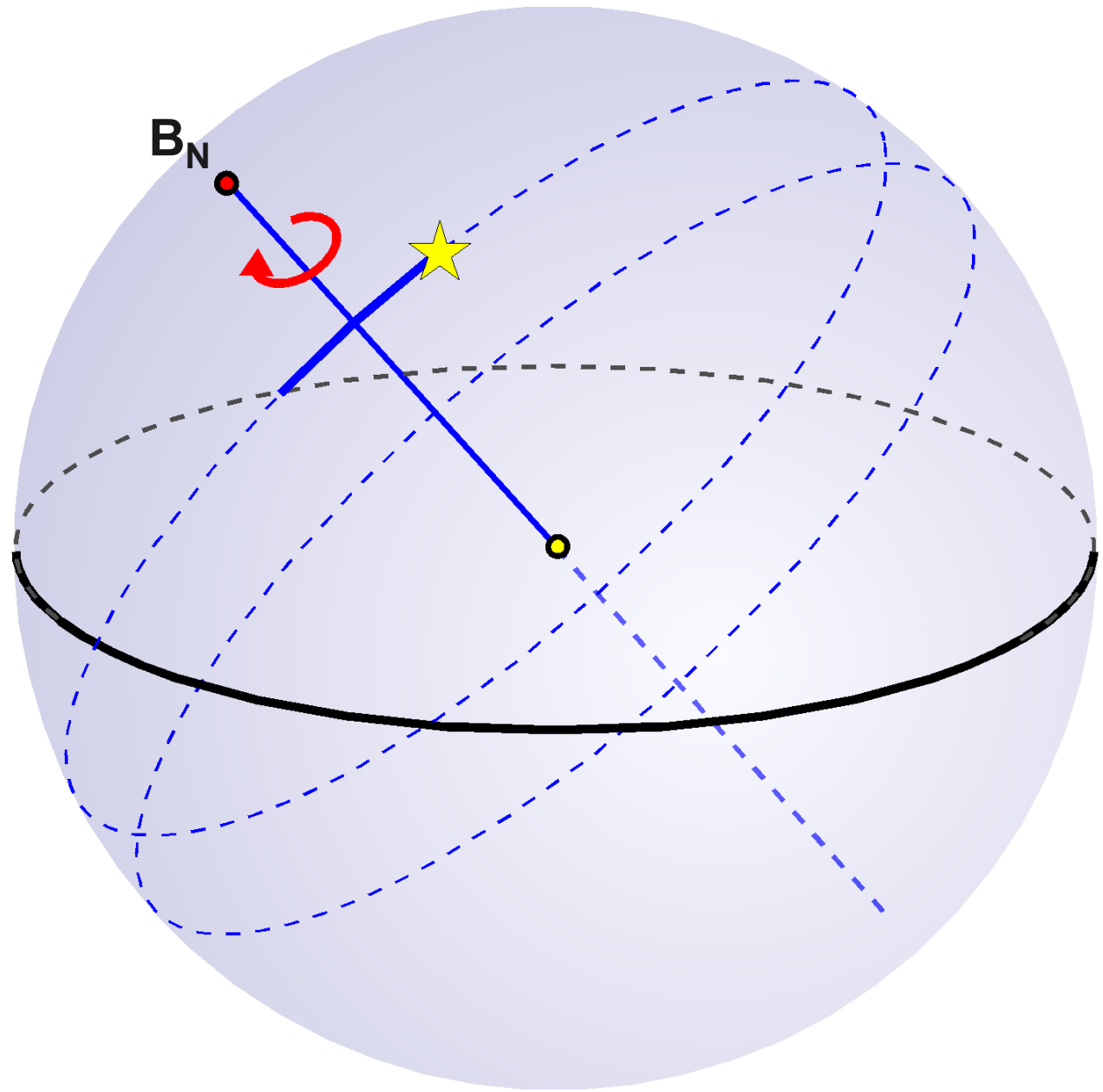


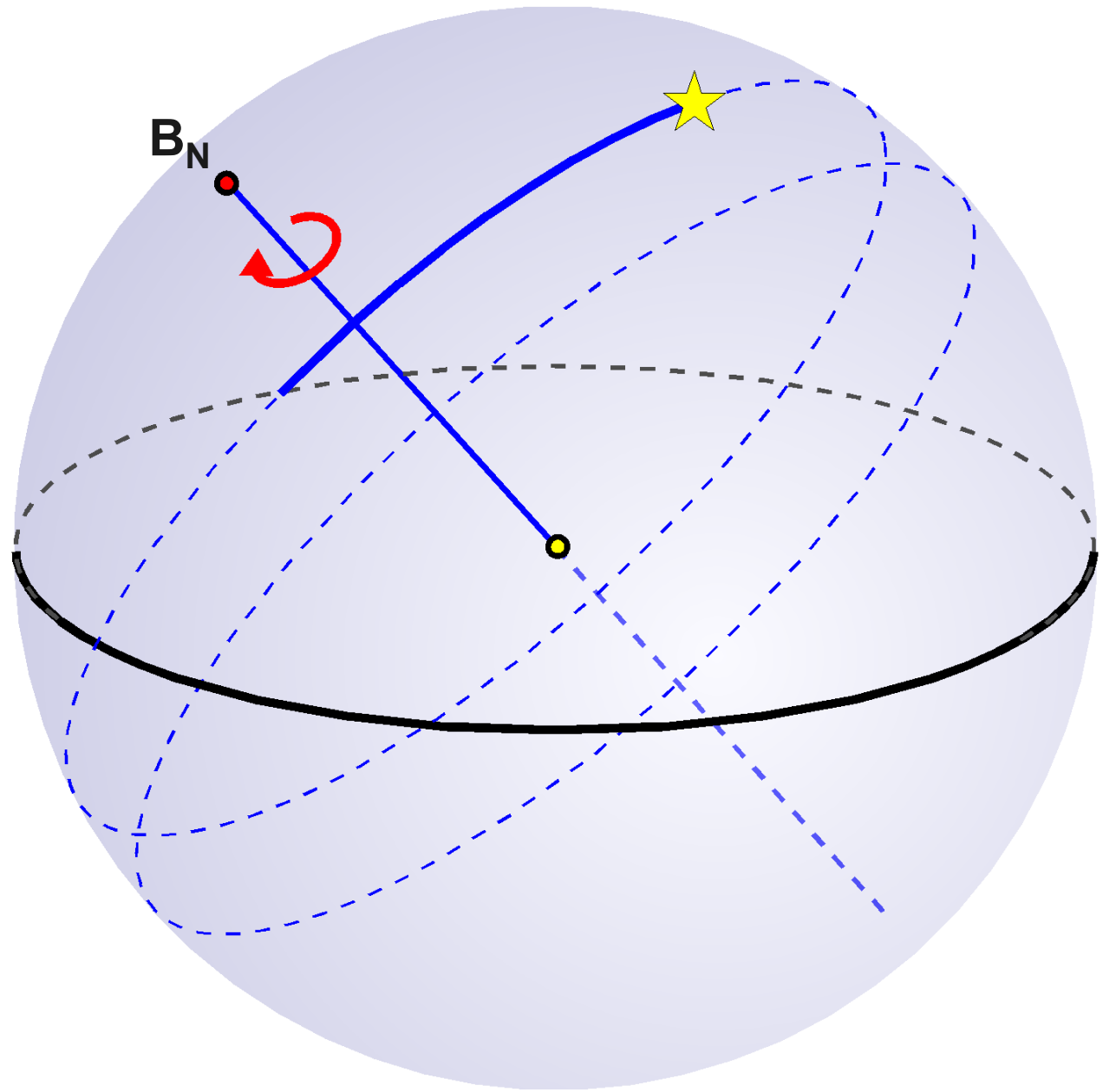


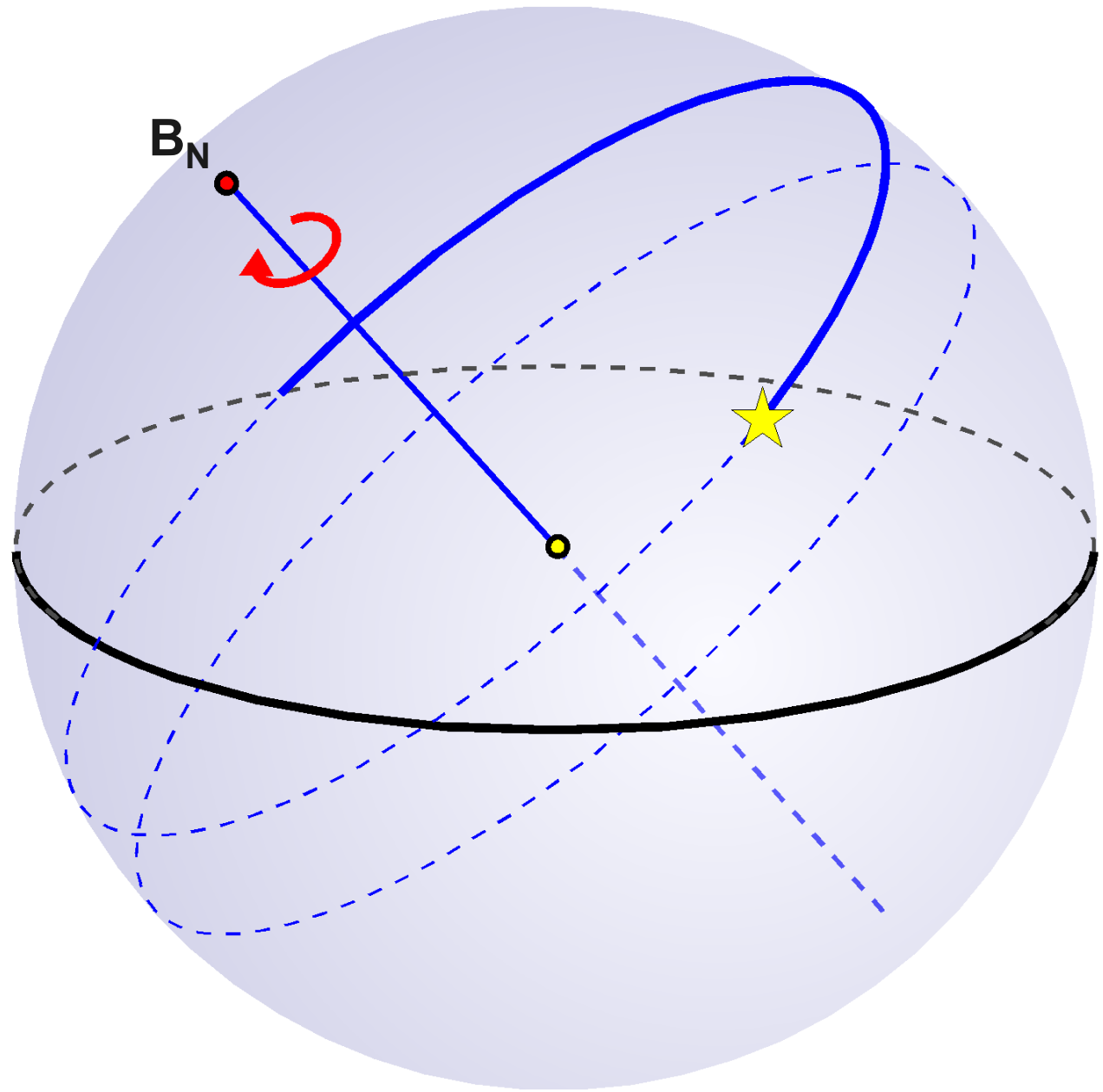


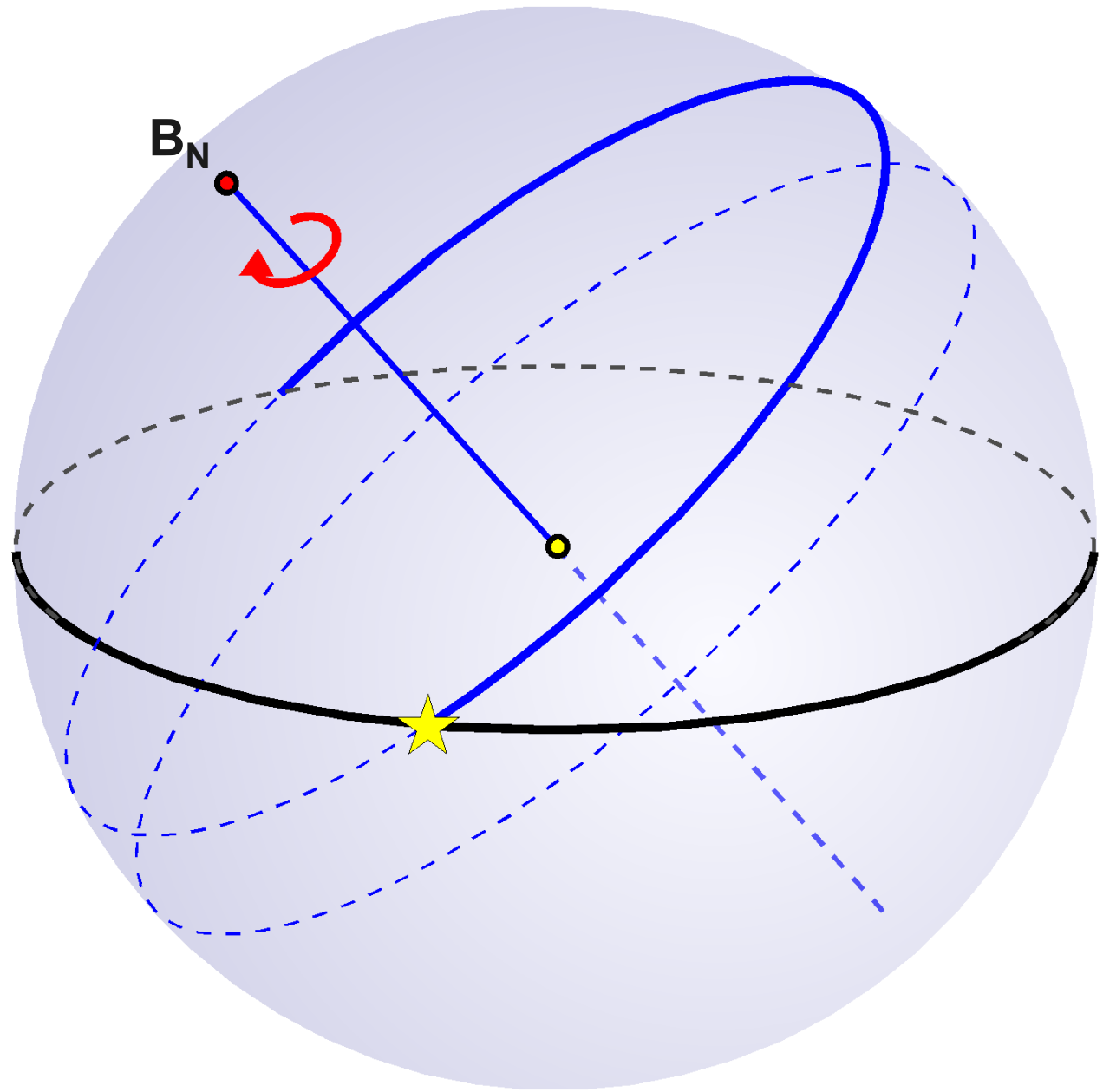


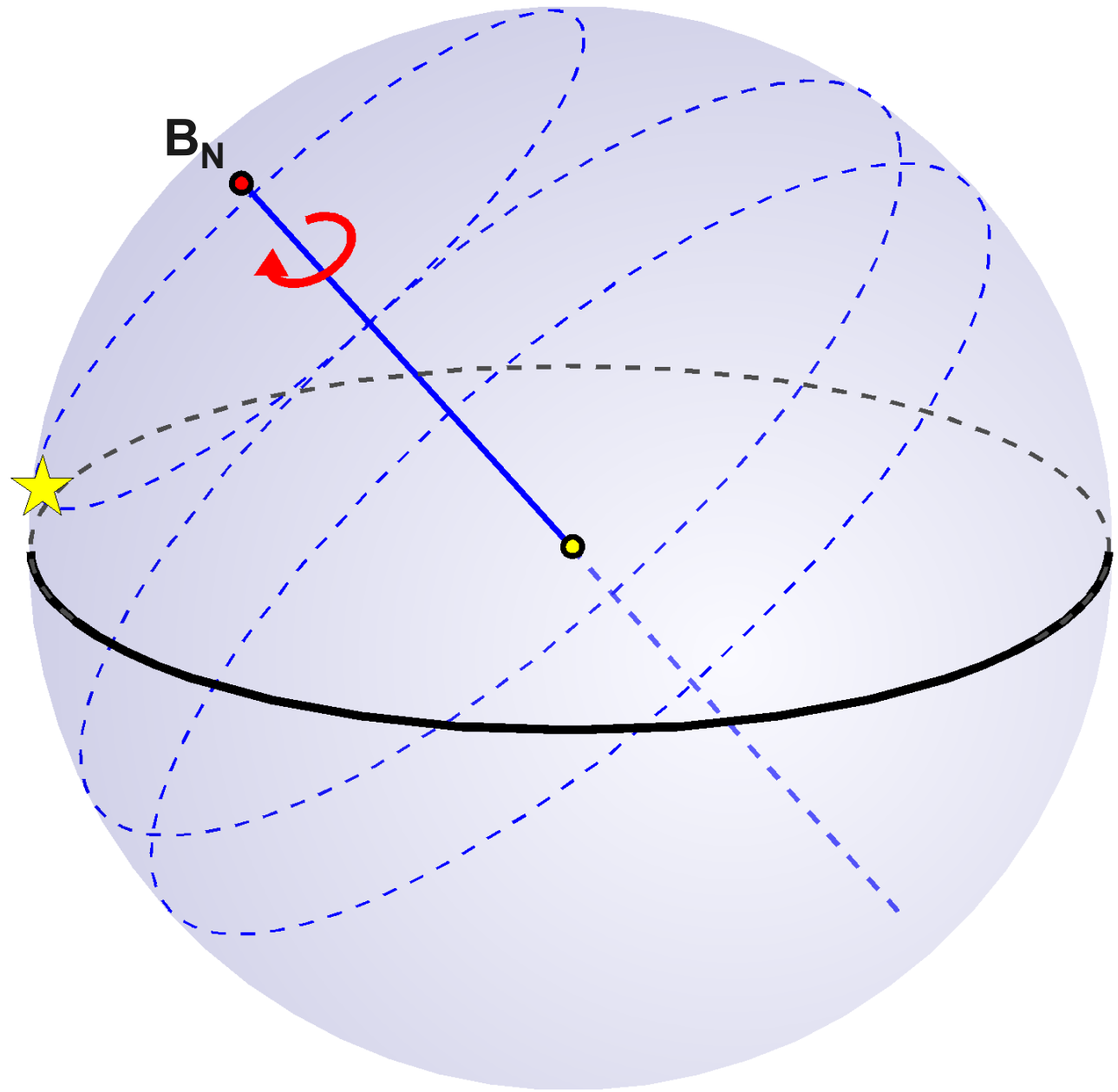


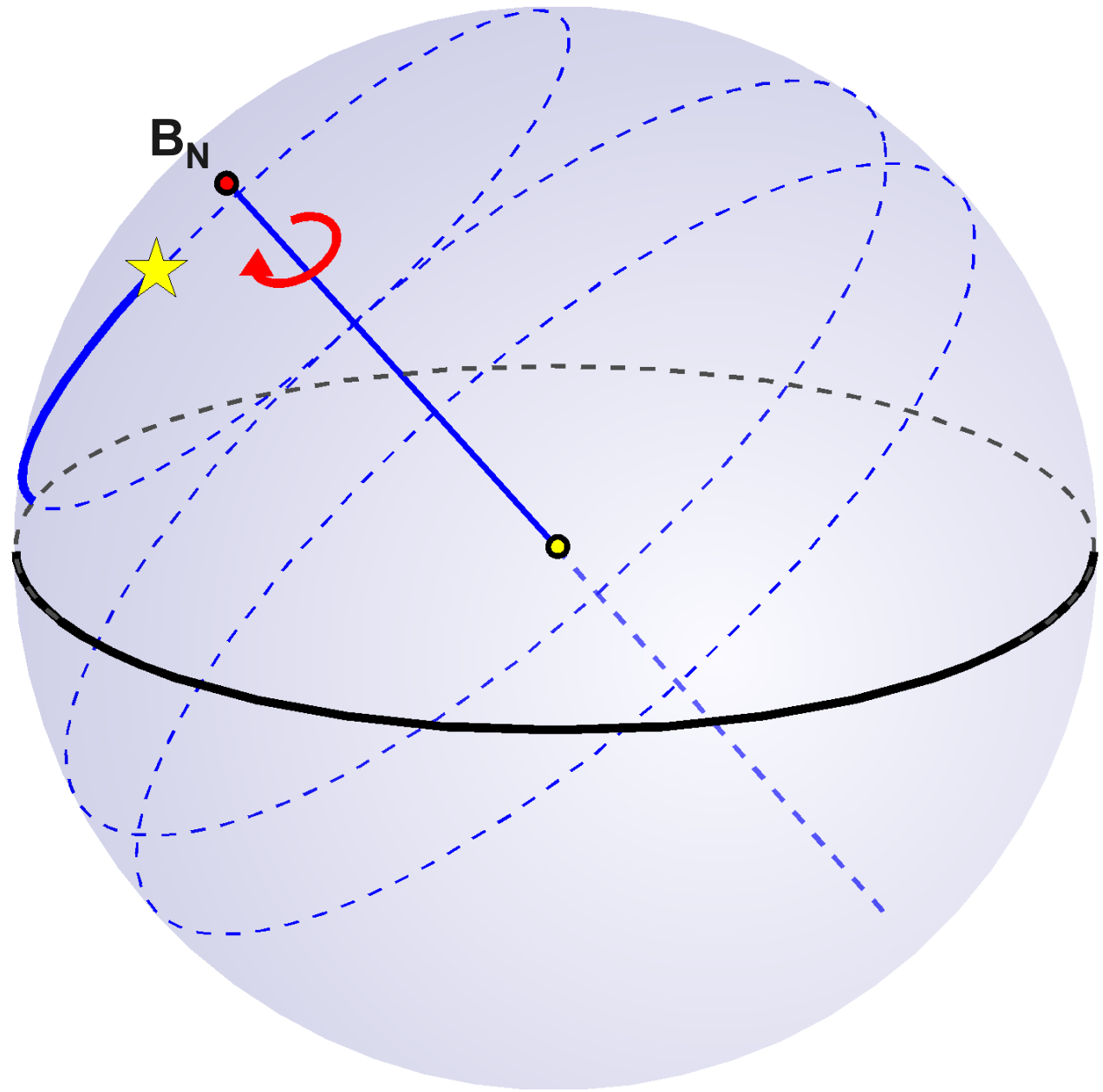


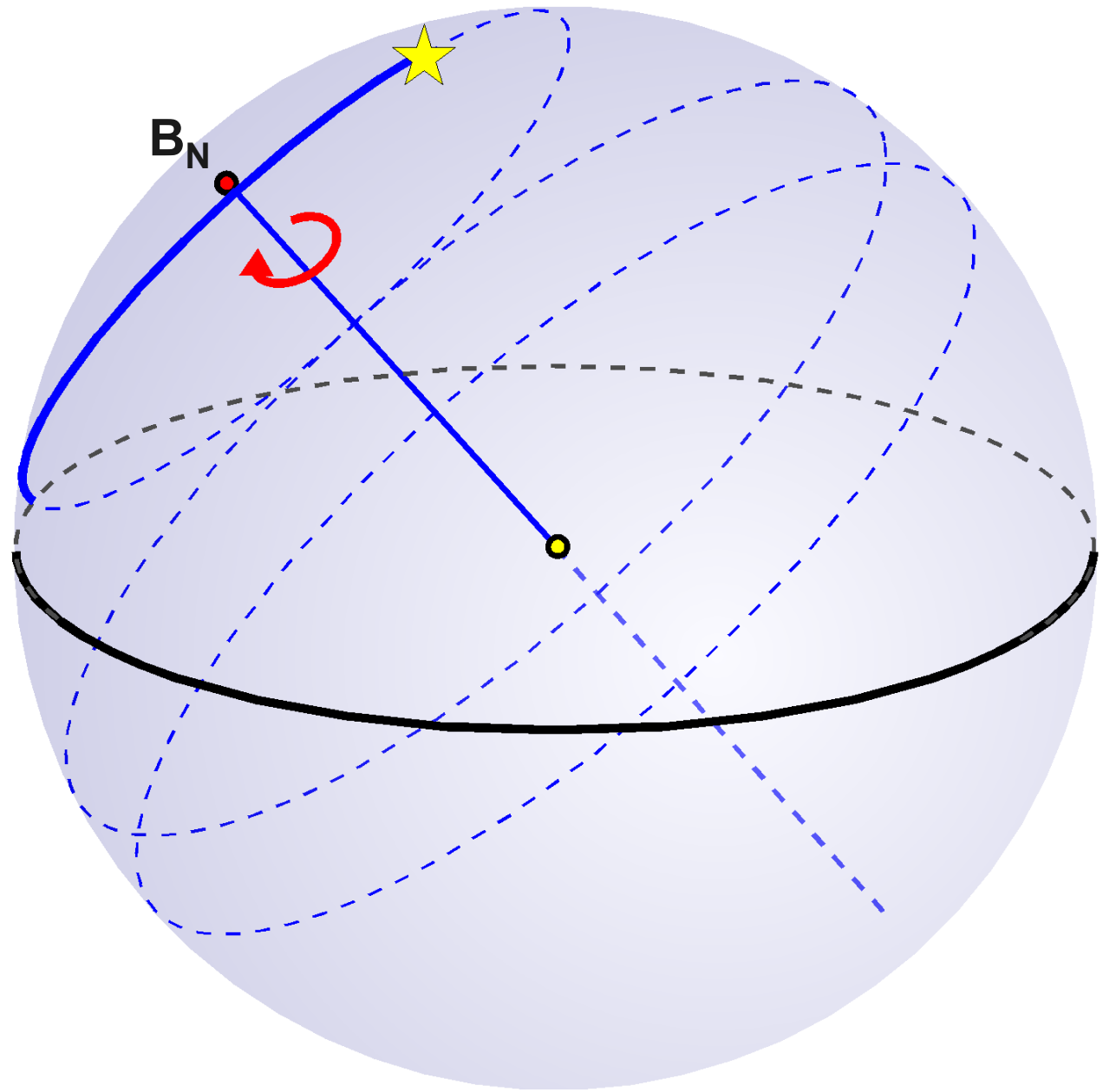


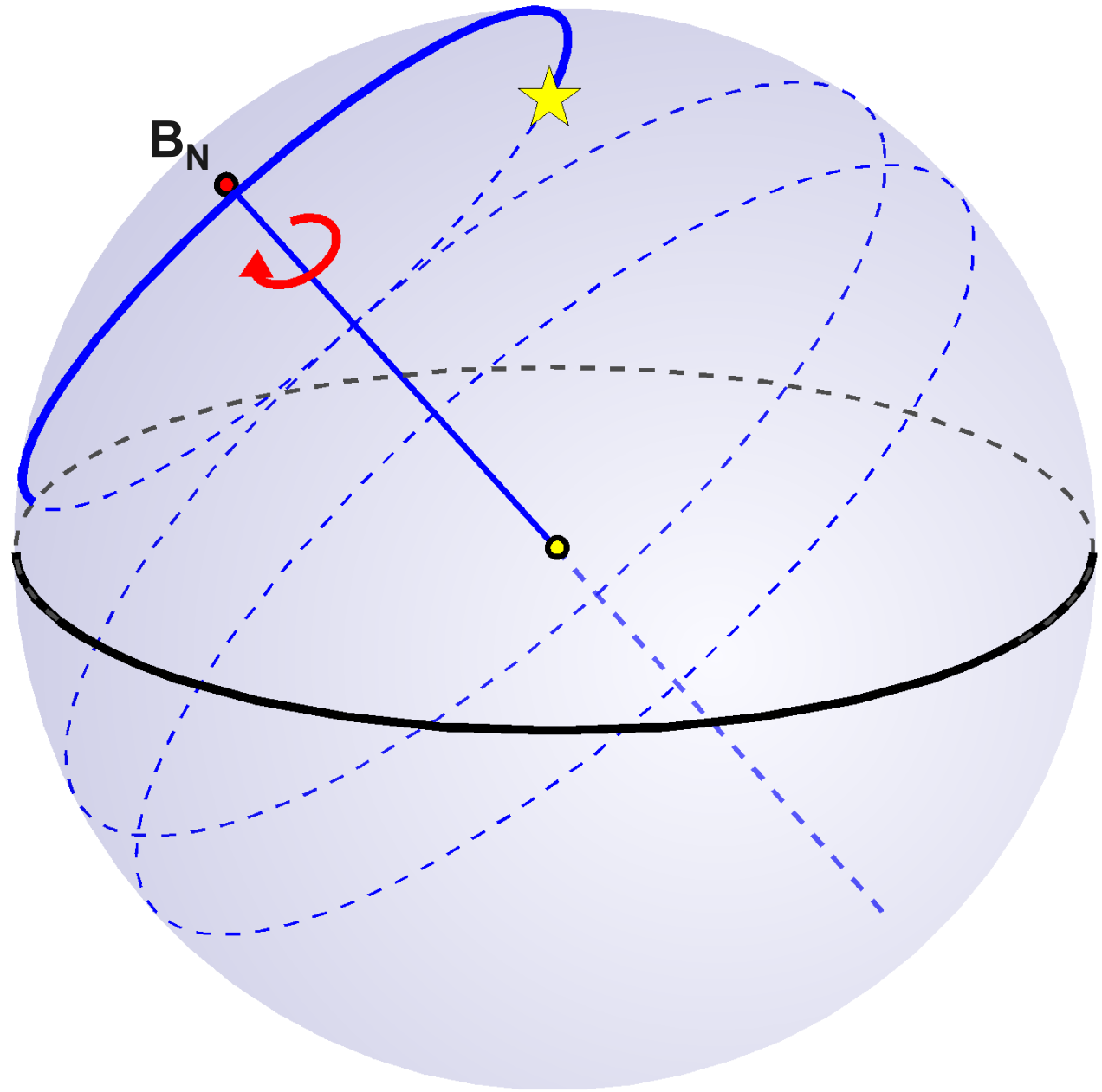


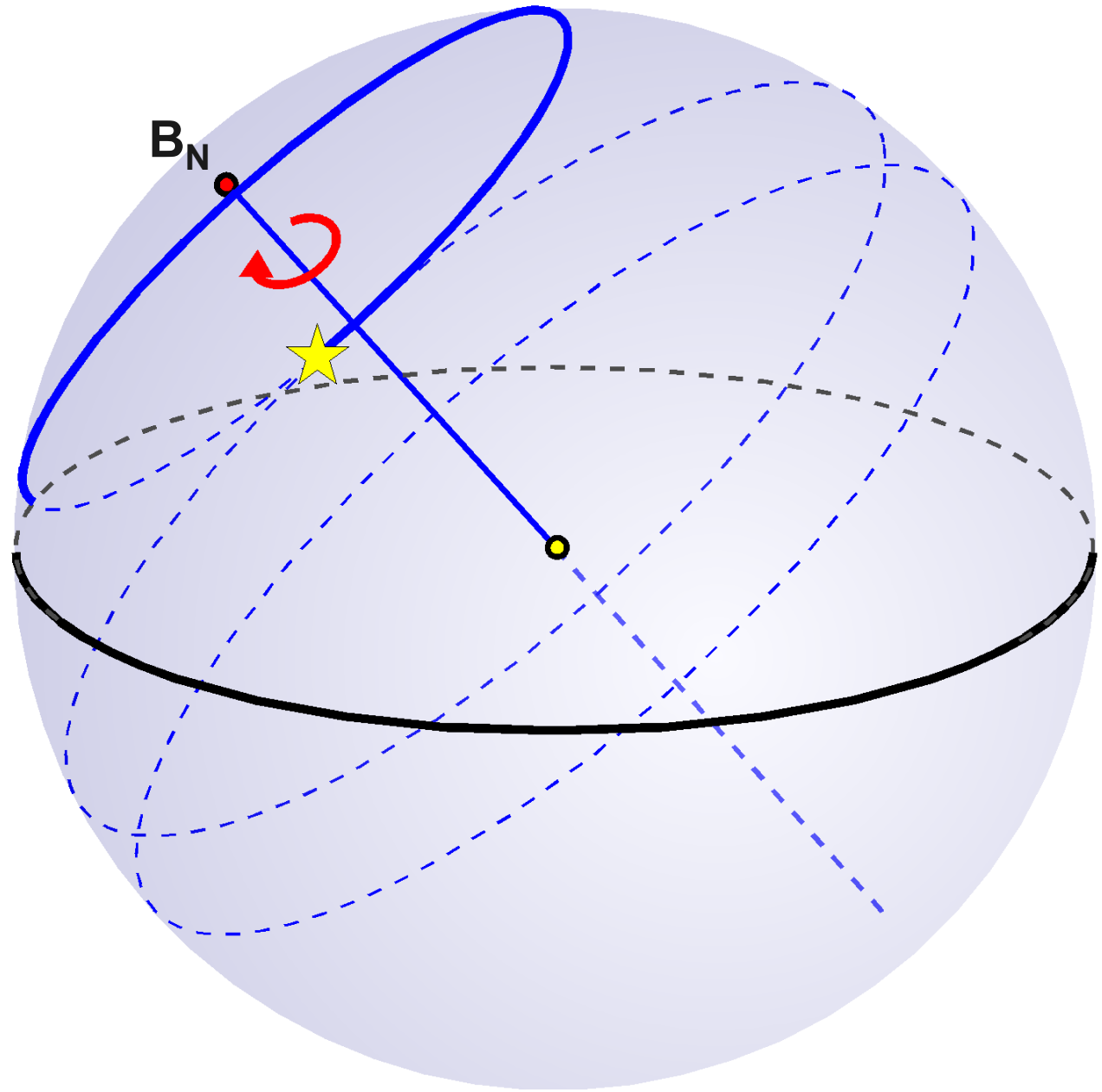


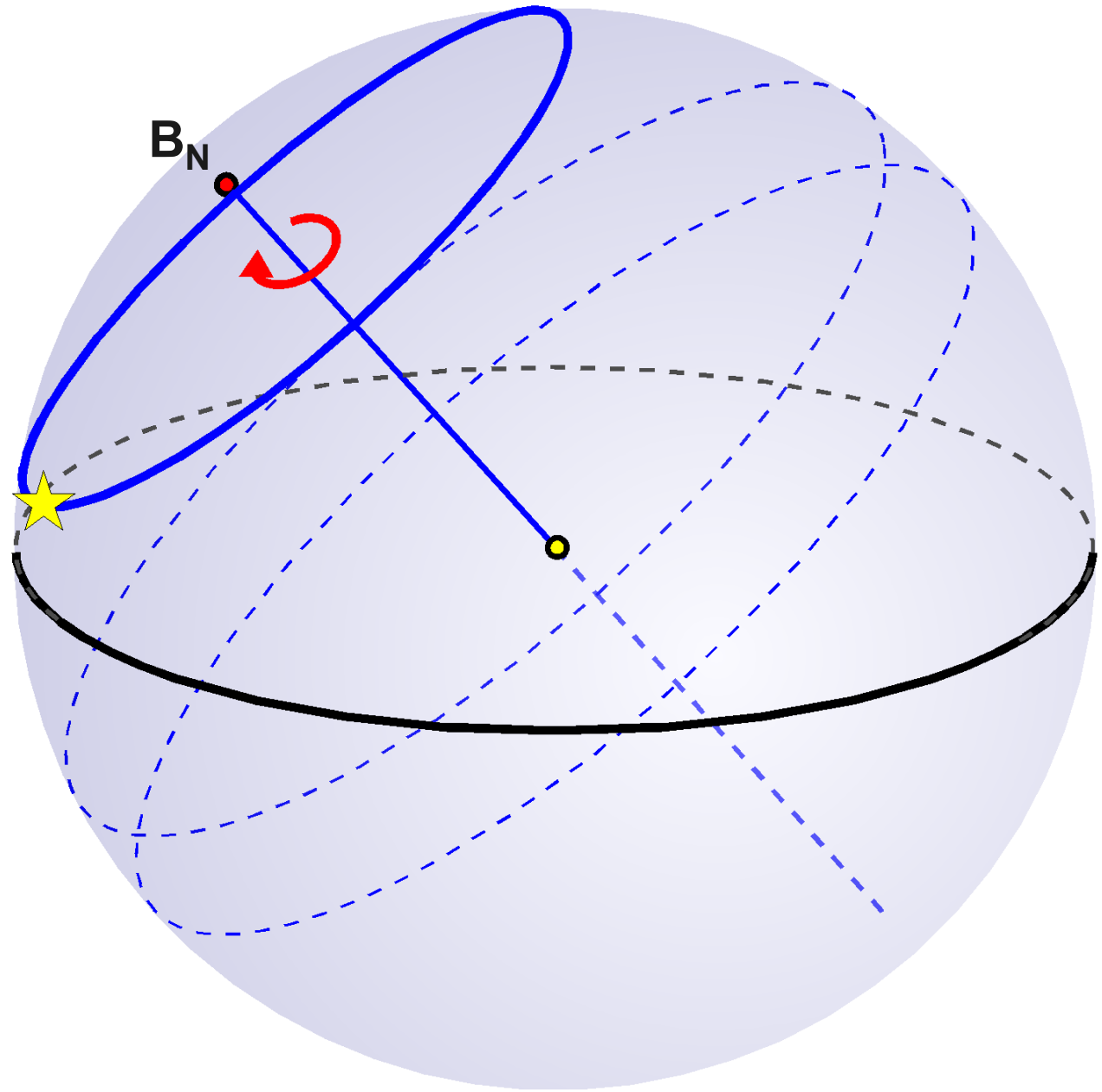




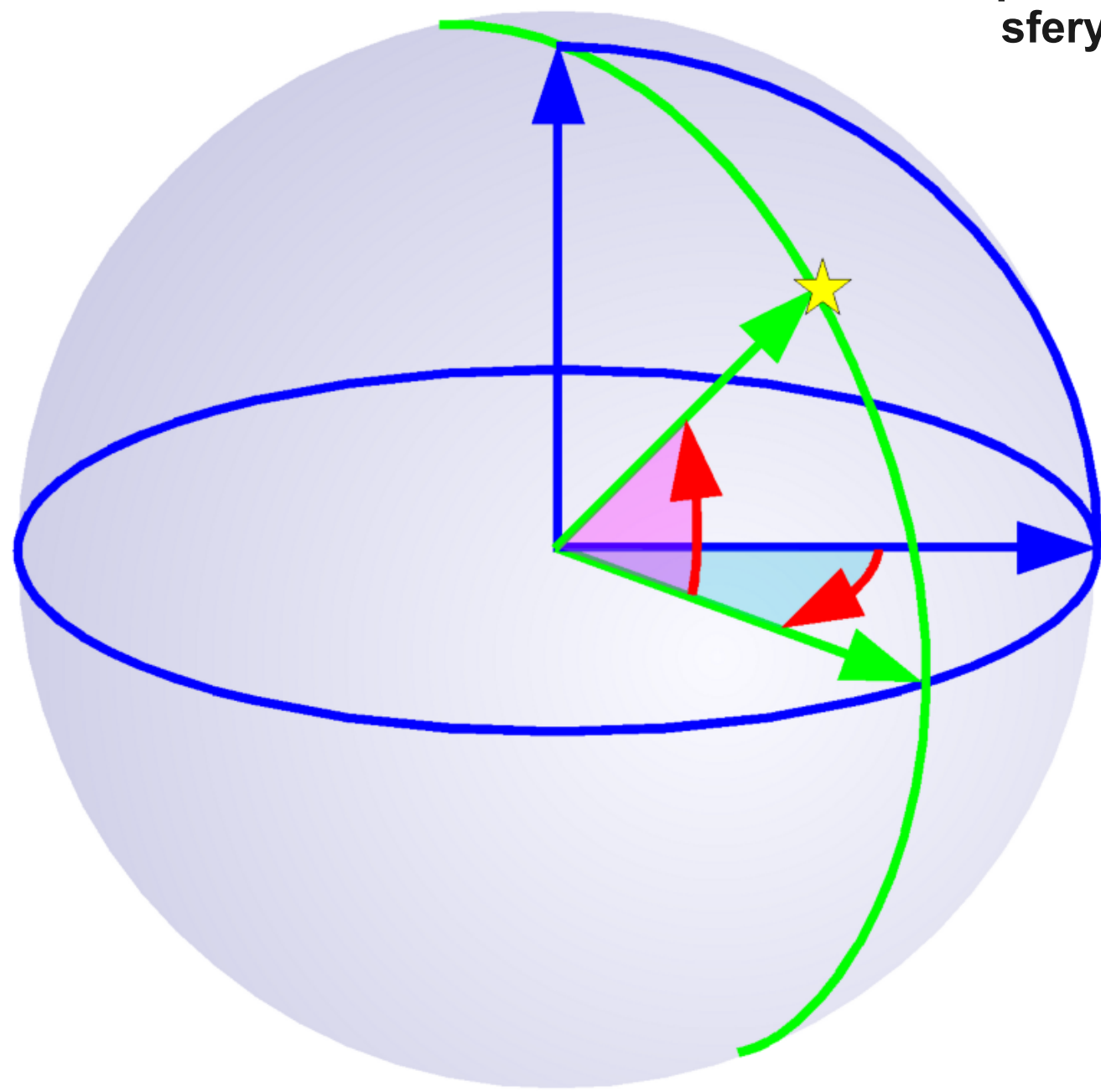


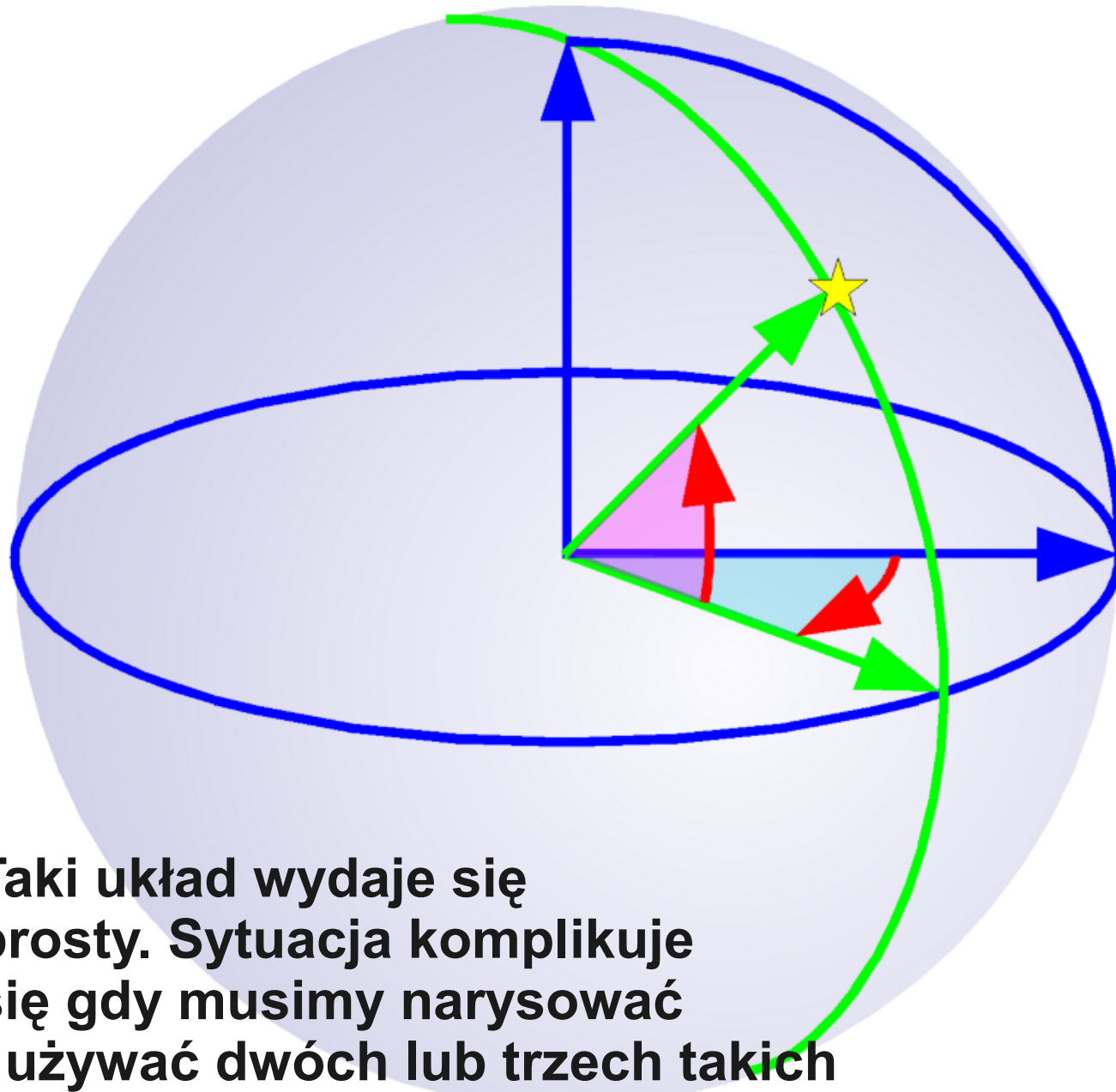




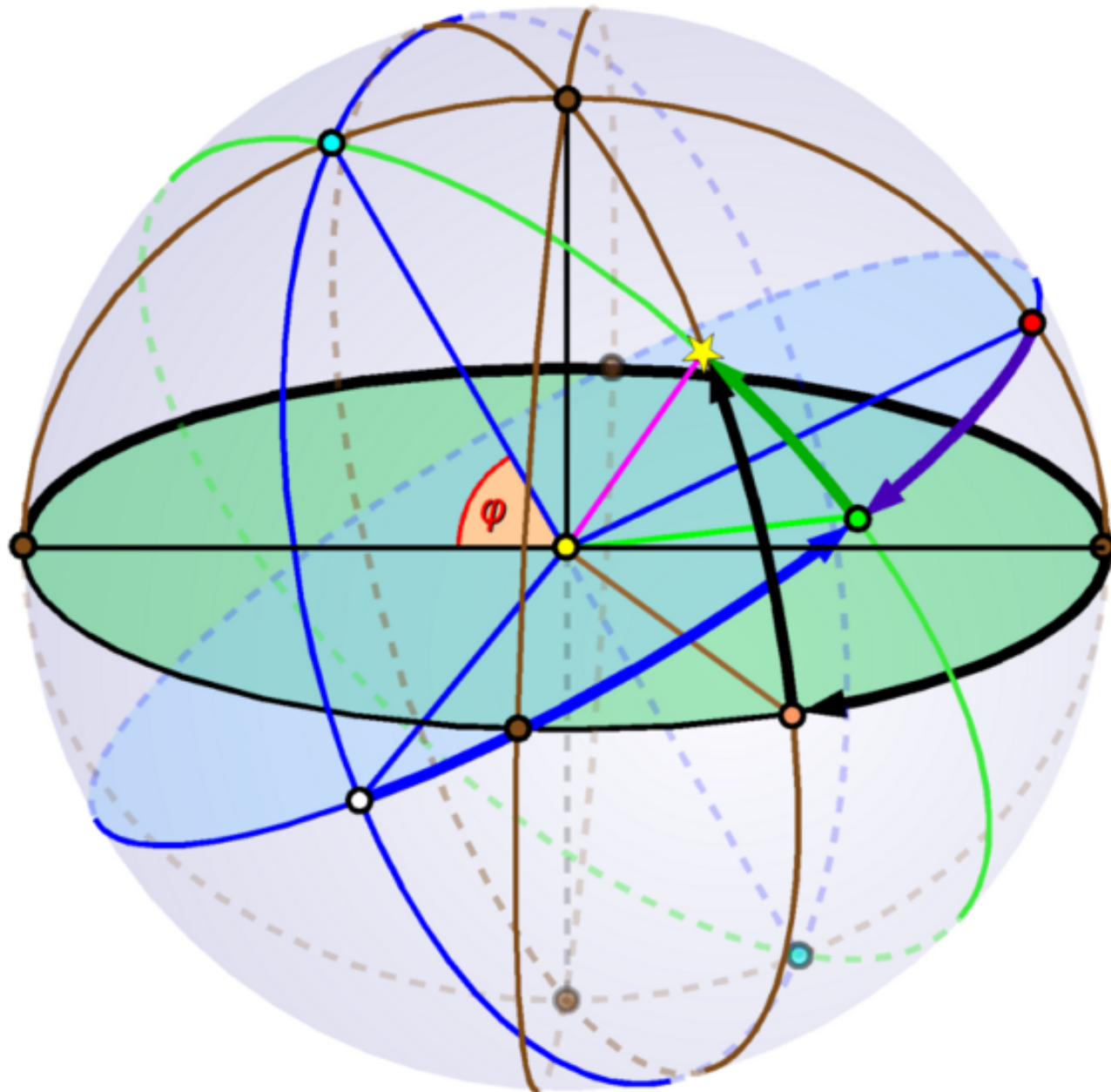


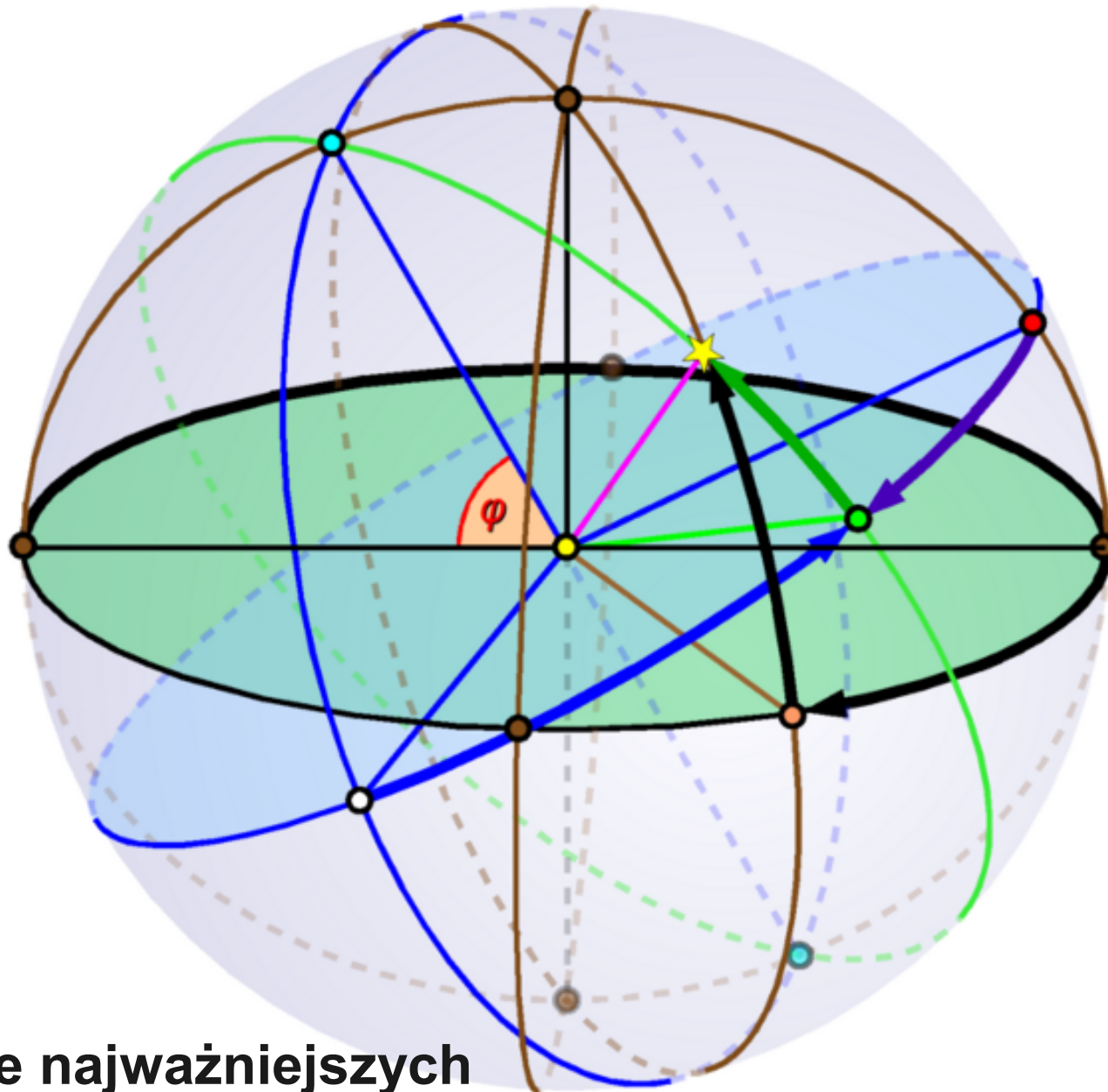
Układ współrzędnych sferycznych



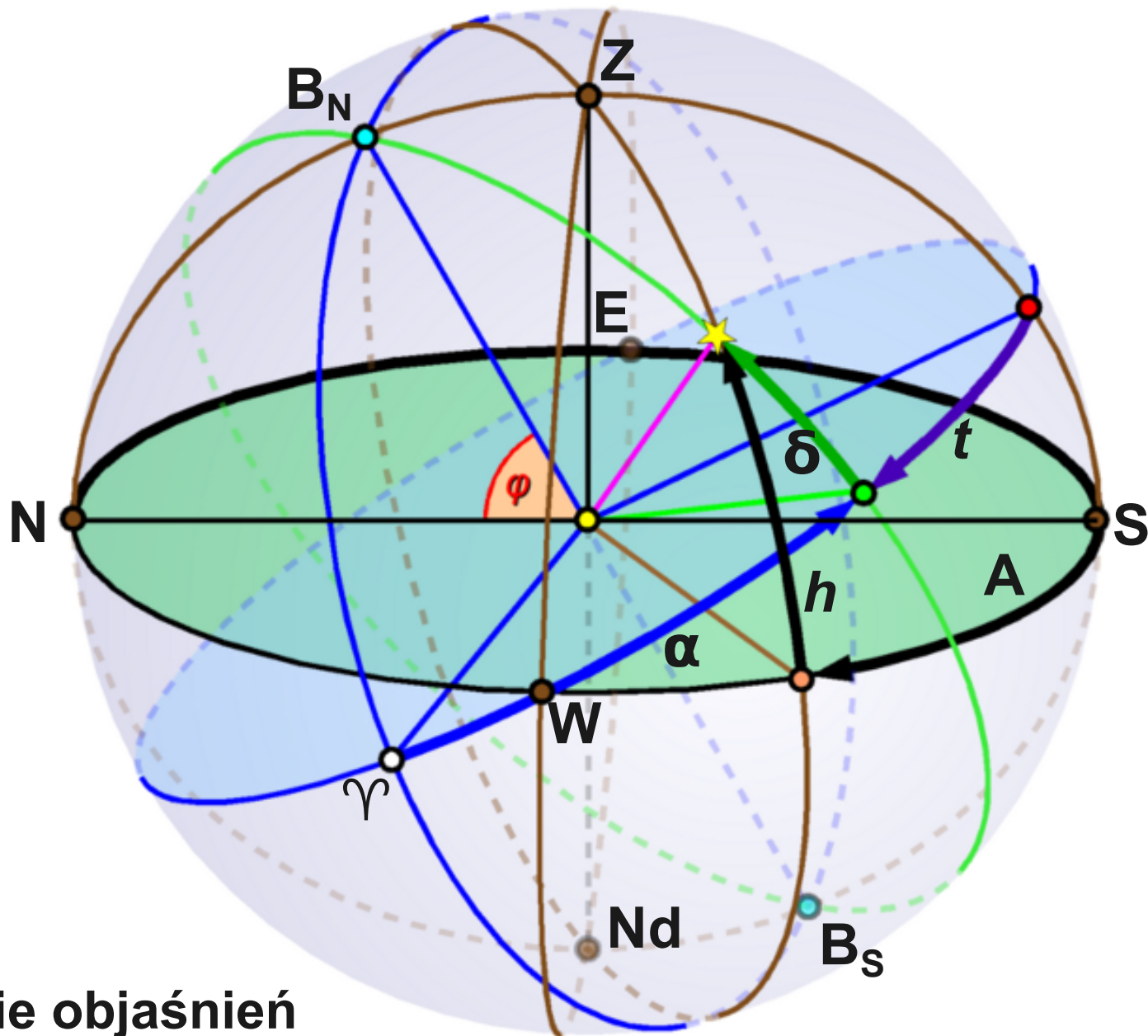


Taki układ wydaje się prosty. Sytuacja komplikuje się gdy musimy narysować i używać dwóch lub trzech takich układów jednocześnie...

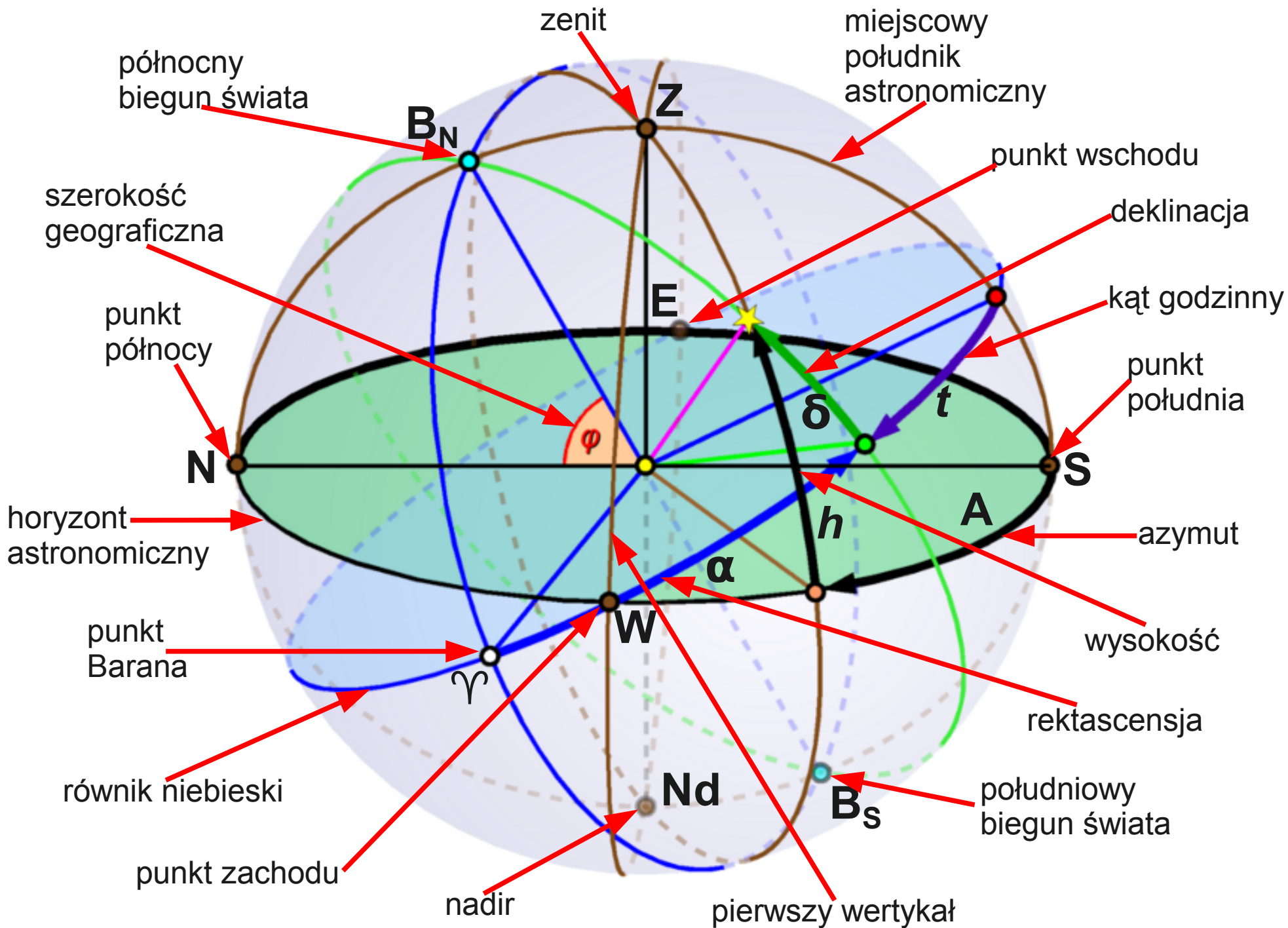




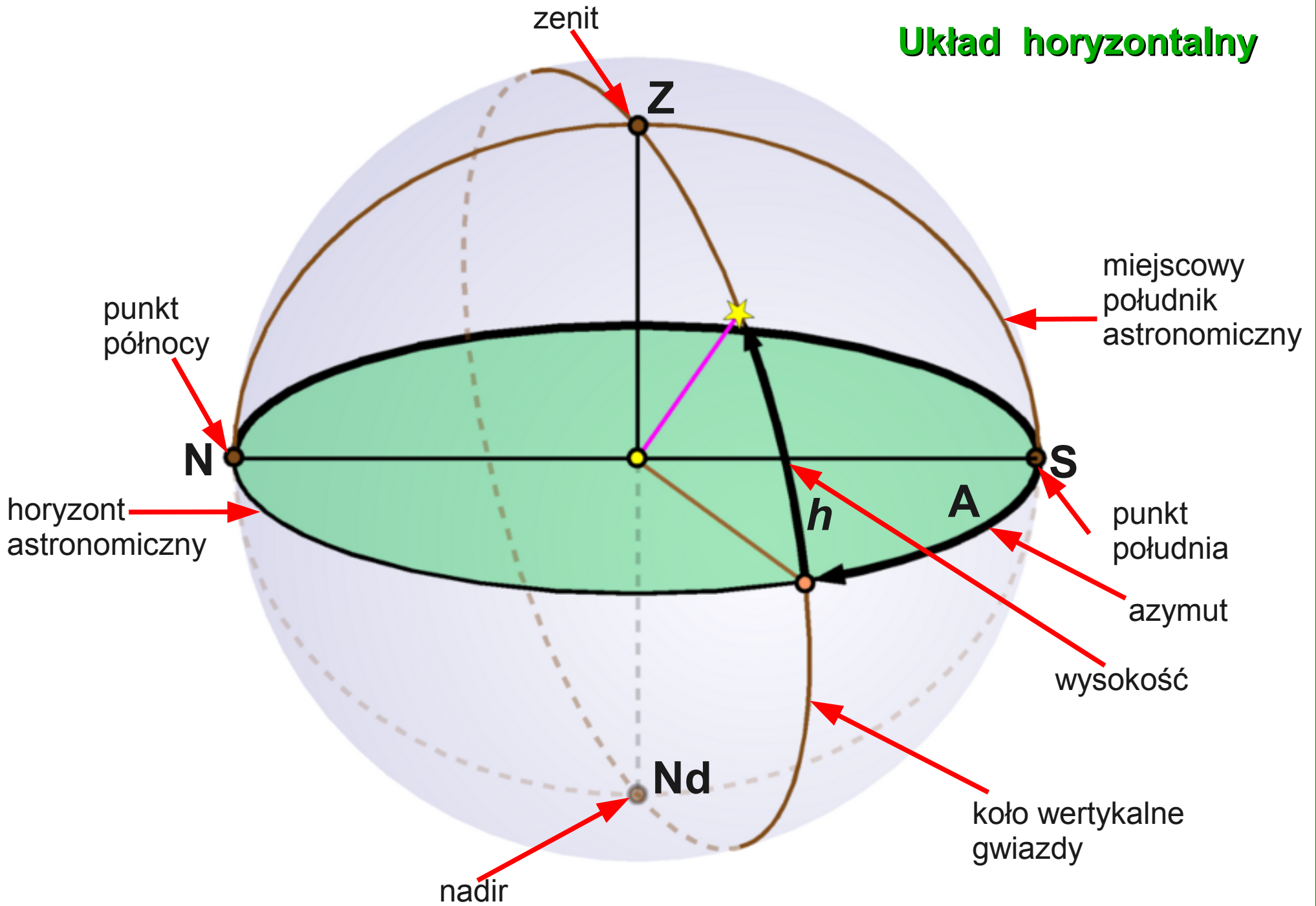
Oznaczenie najważniejszych punktów i kątów niewiele pomoże...



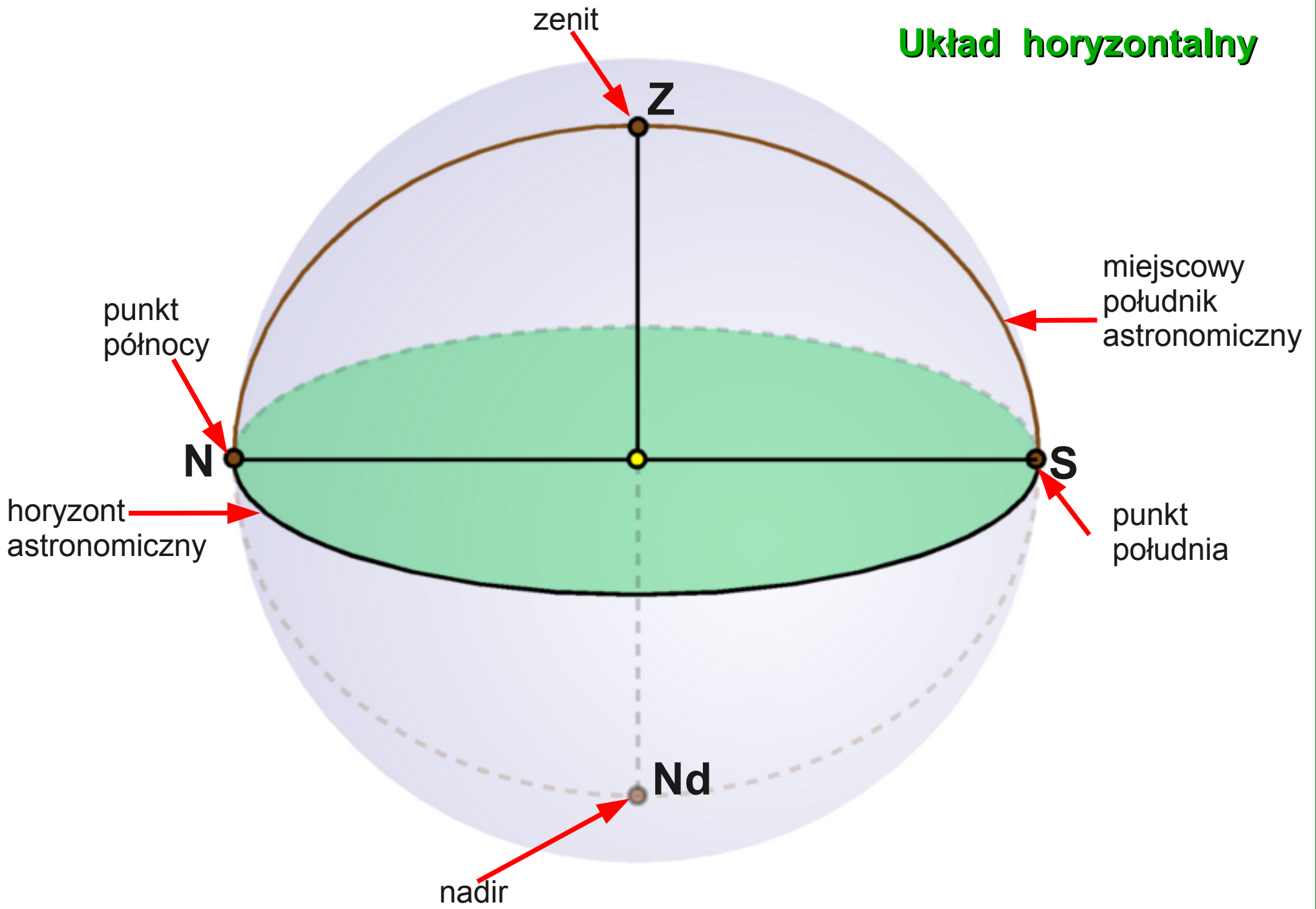
A dodanie objaśnień
tylko skomplikuje rysunek...



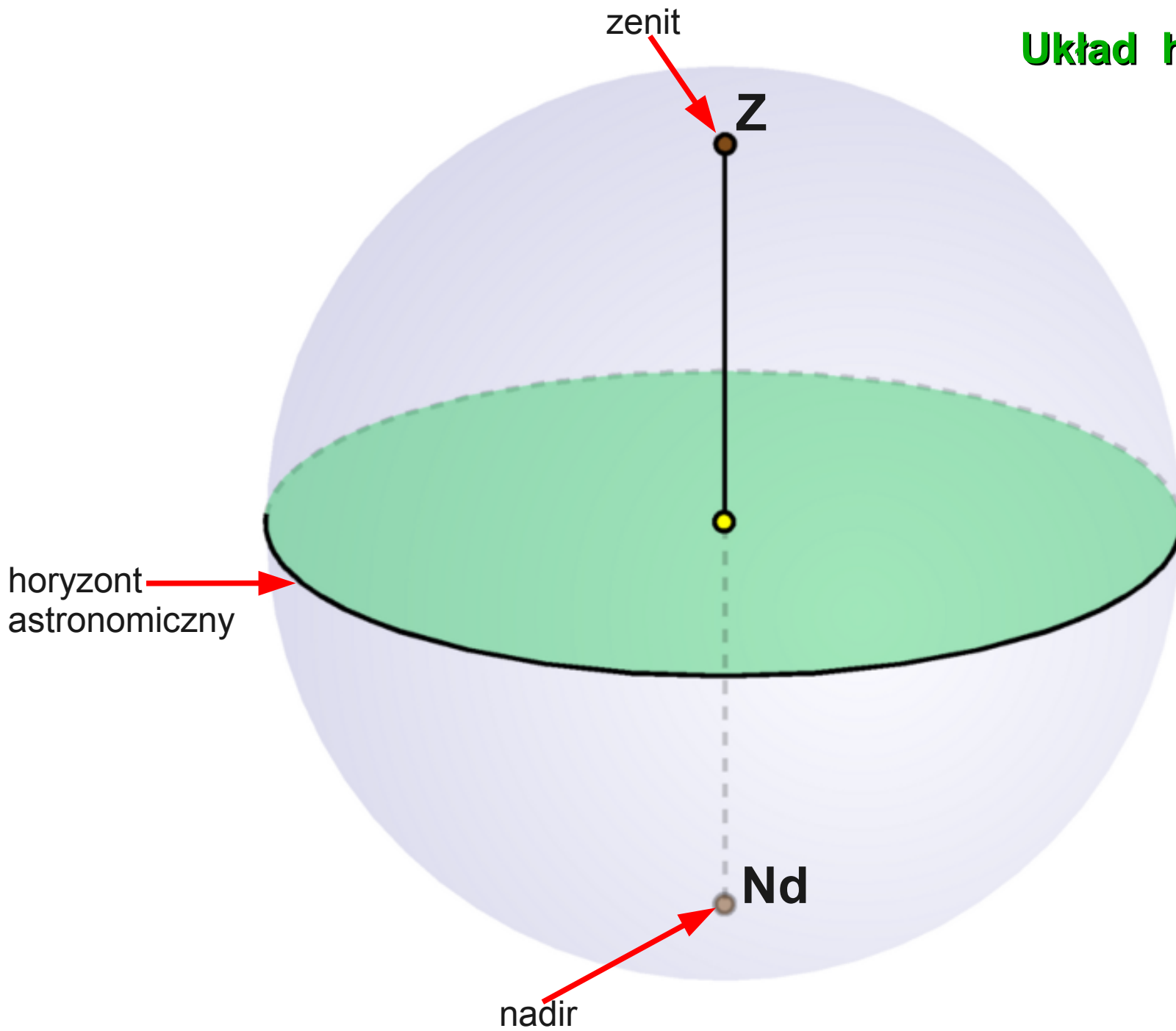
Układ horyzontalny



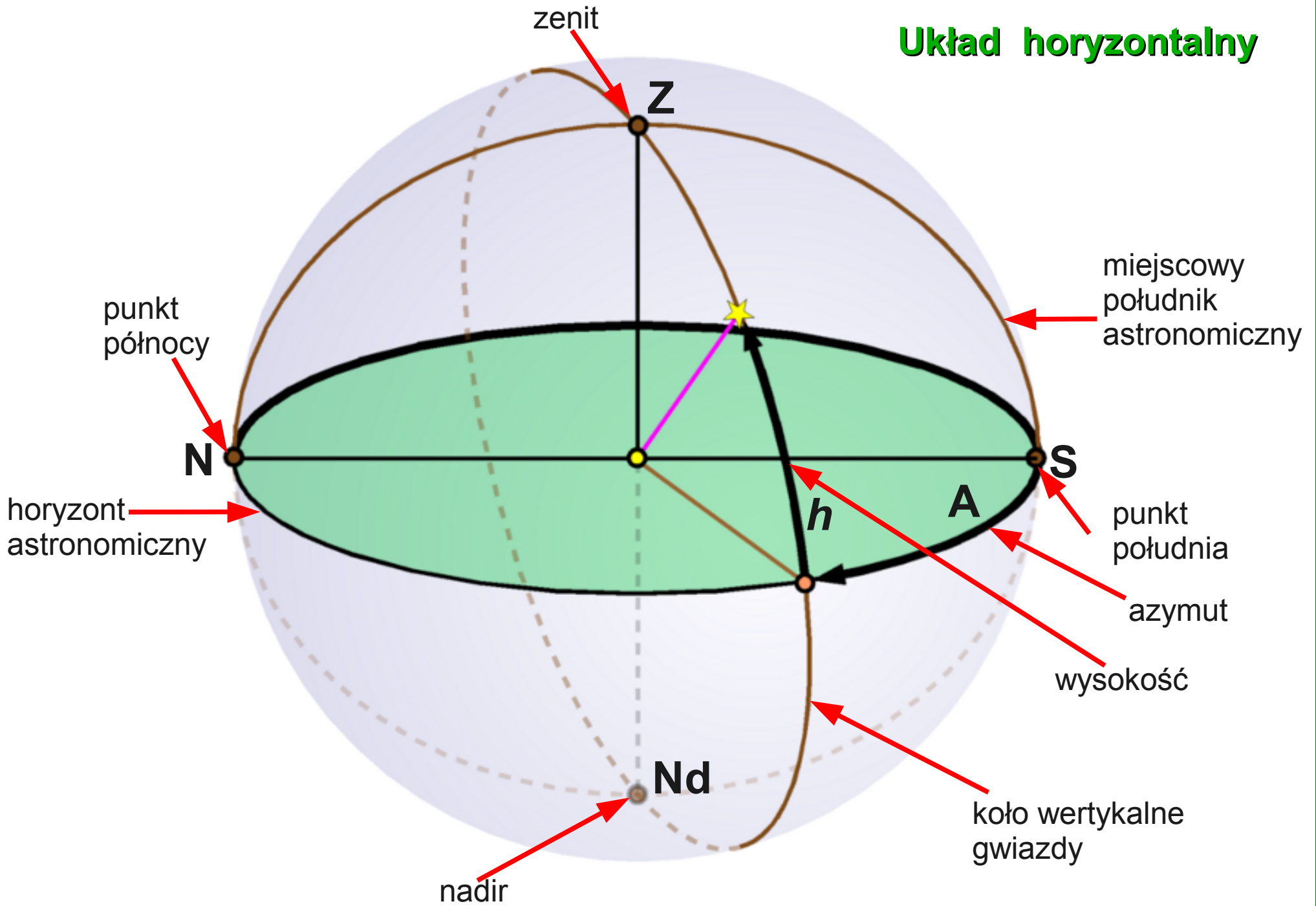
Układ horyzontalny



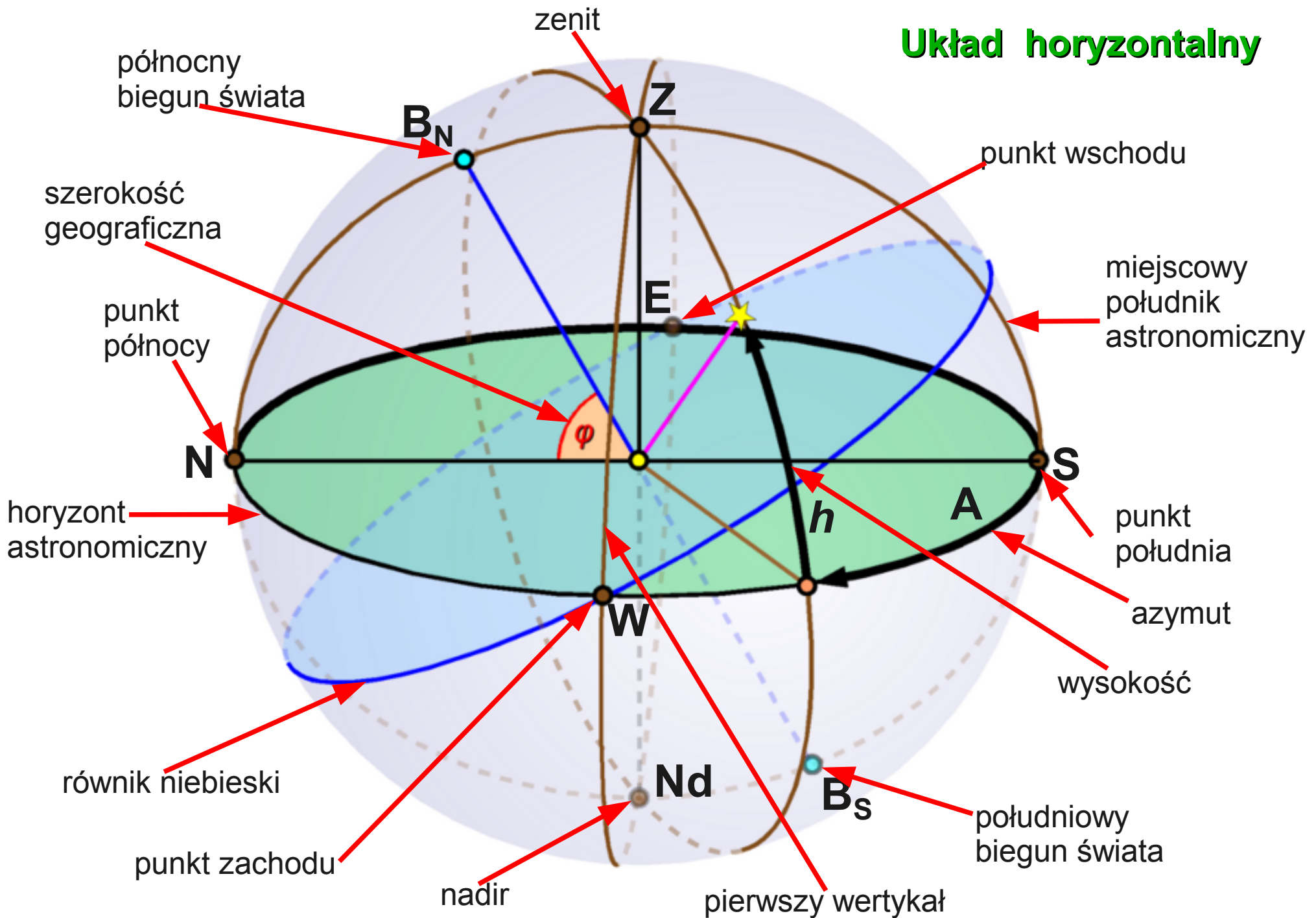
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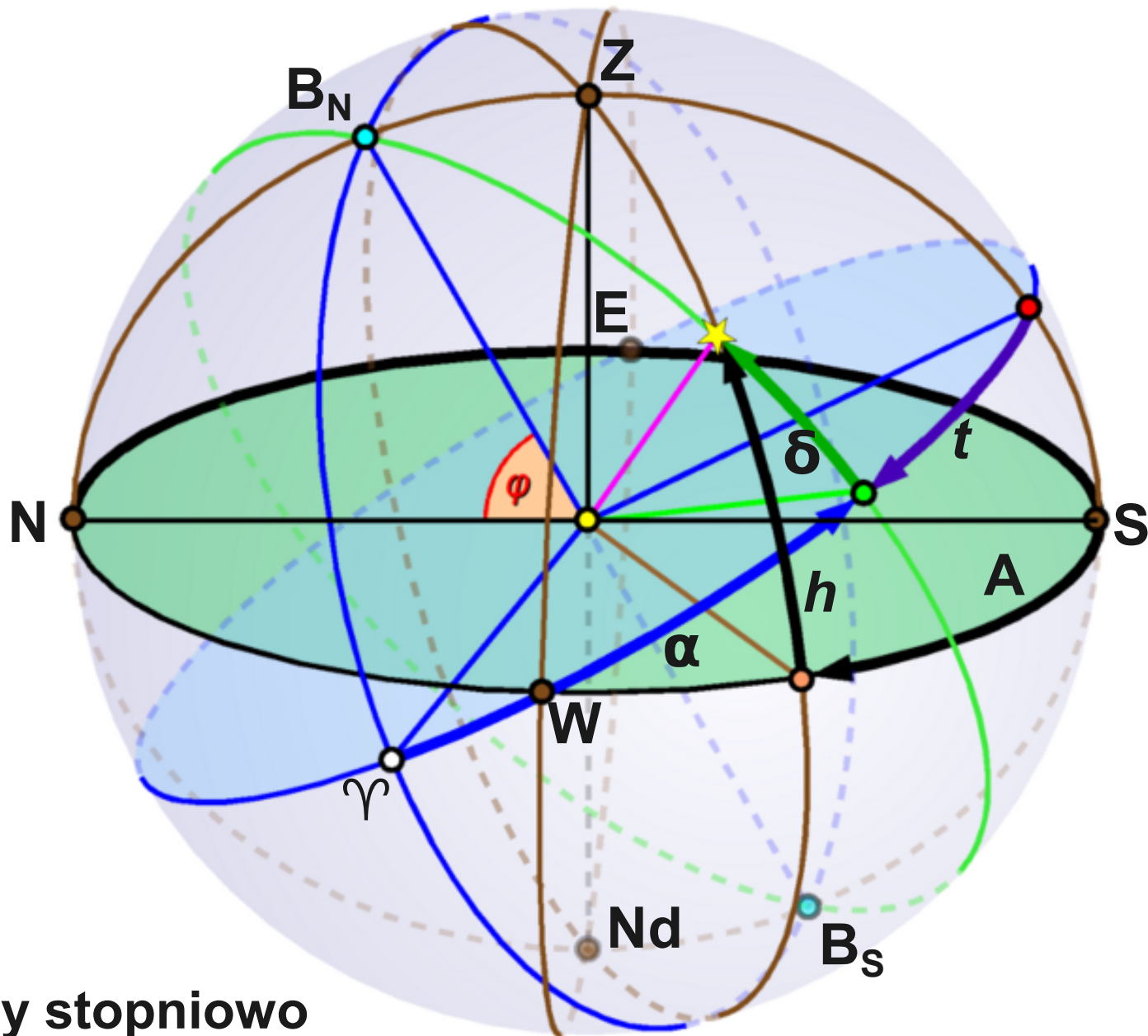


Układ horyzontalny

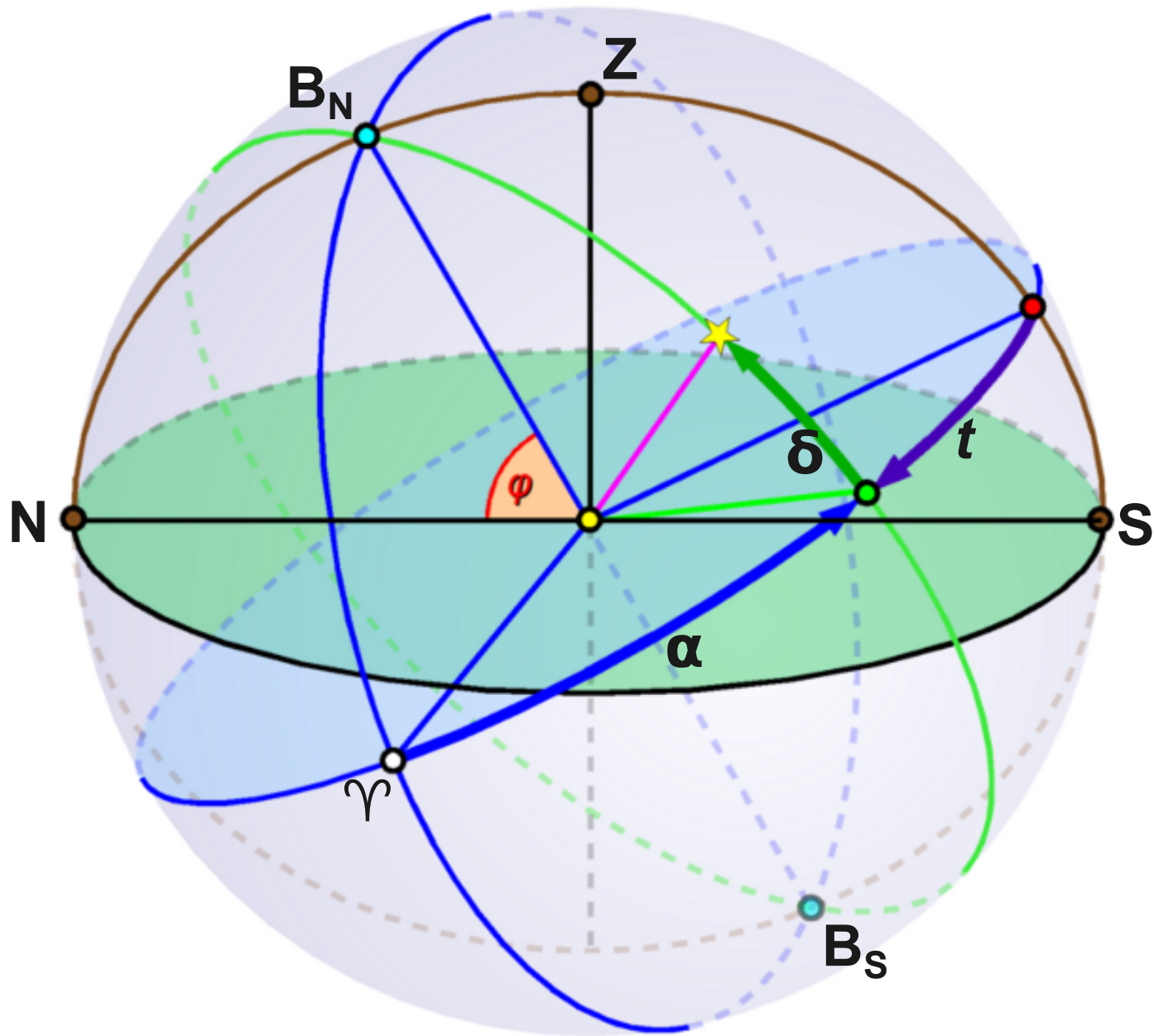


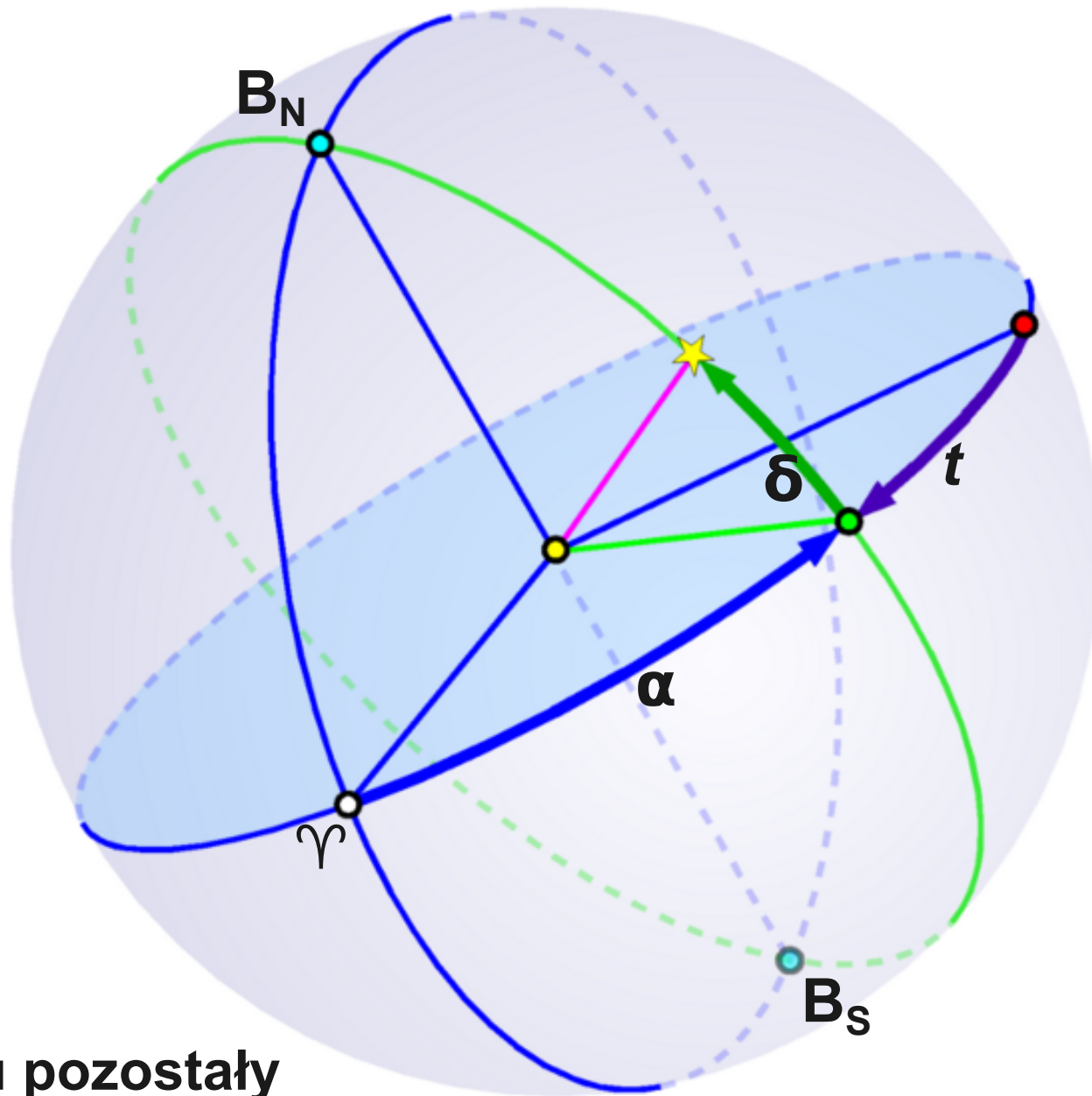
Układ horyzontalny



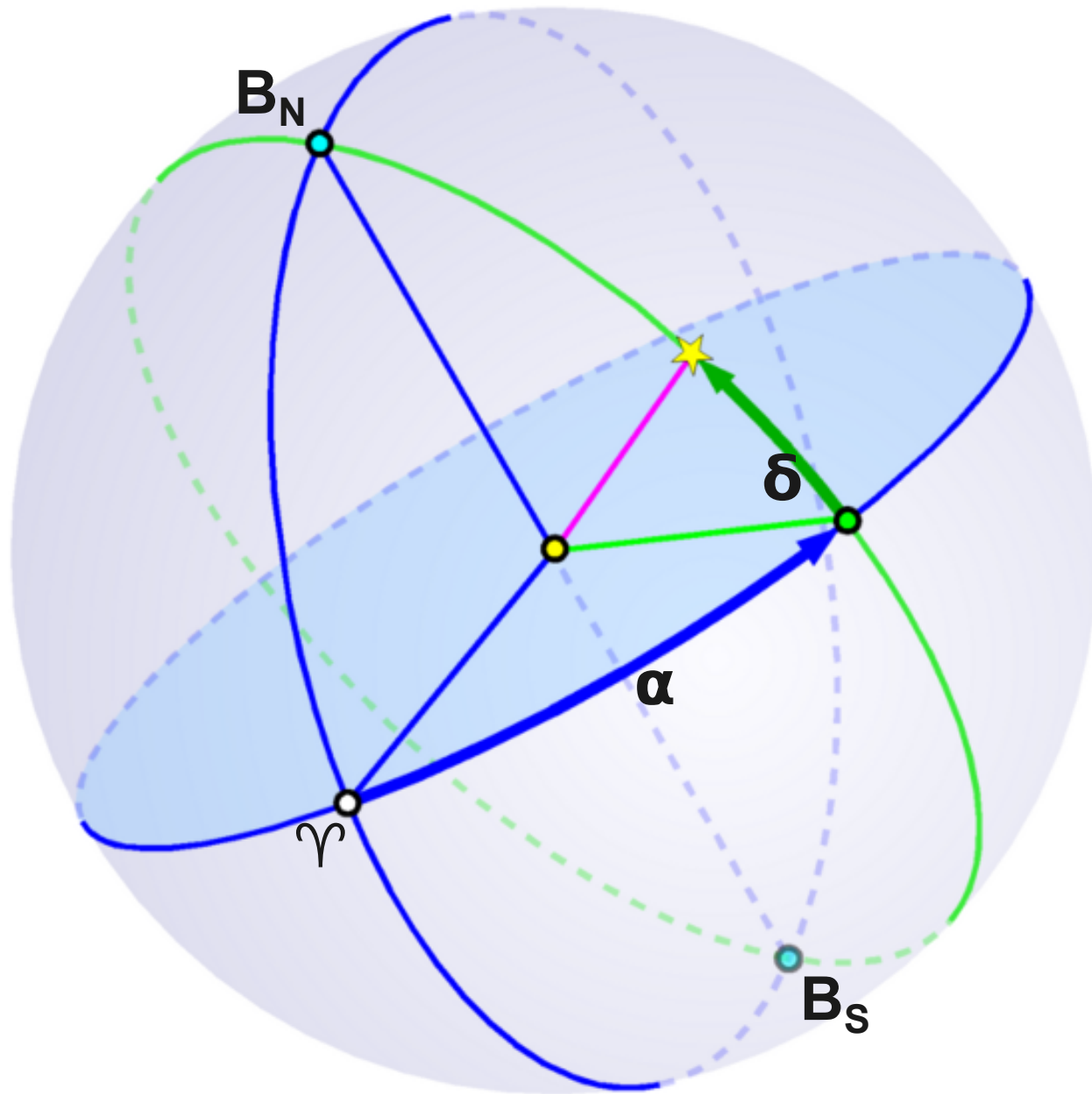


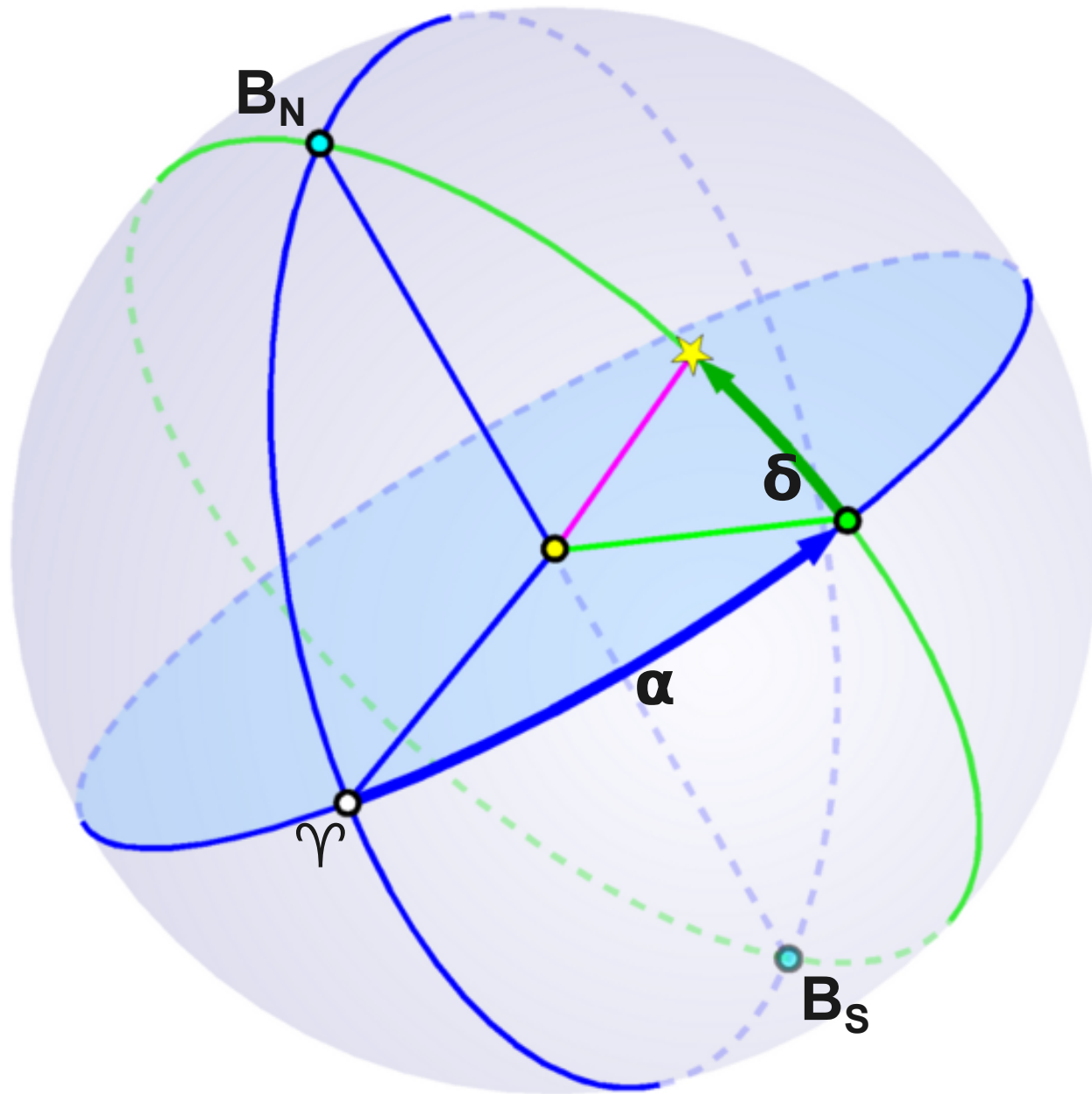
Usuwamy stopniowo
elementy układu horyzontalnego...



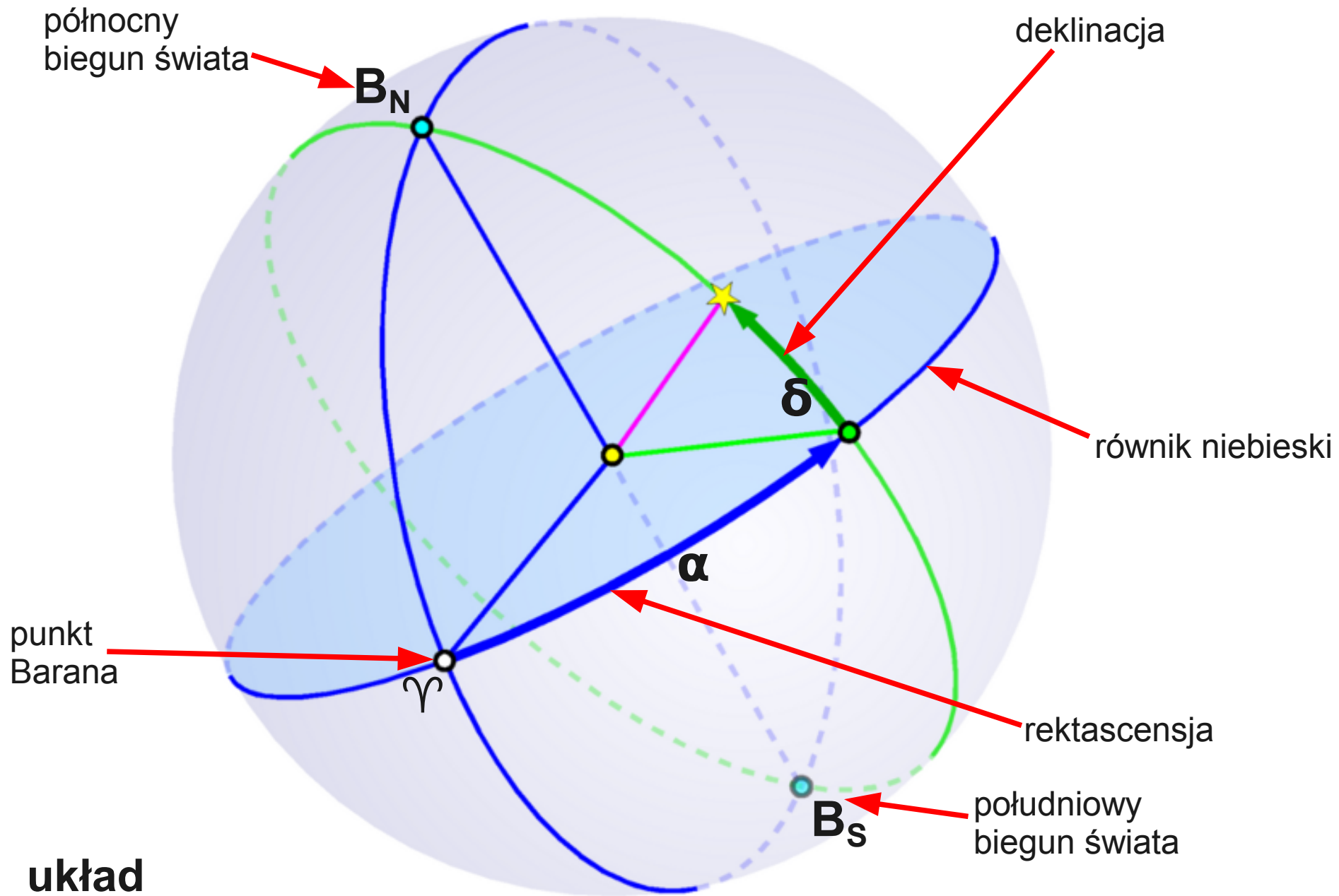


Na rysunku pozostały
tylko elementy układów równikowych...

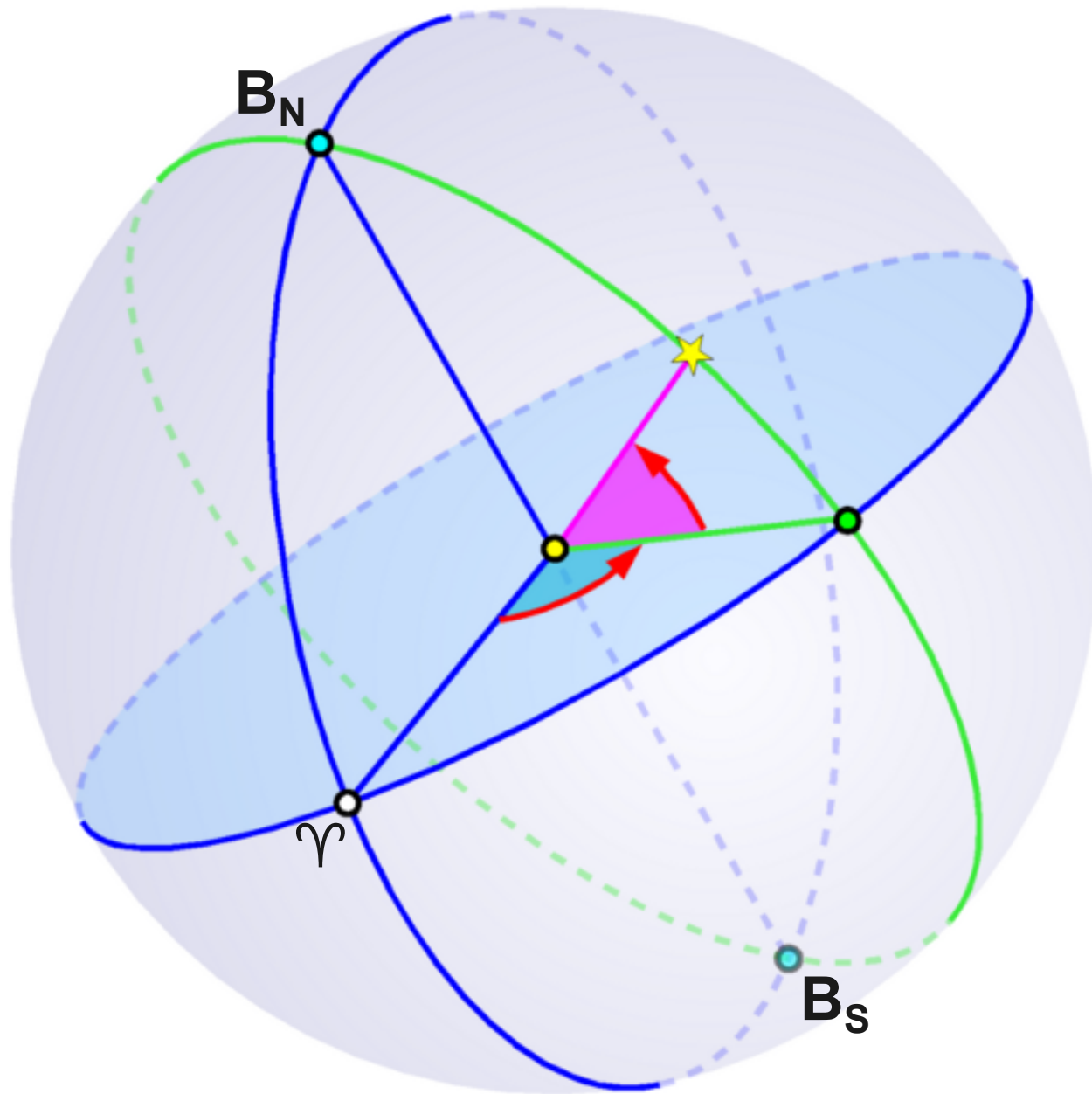


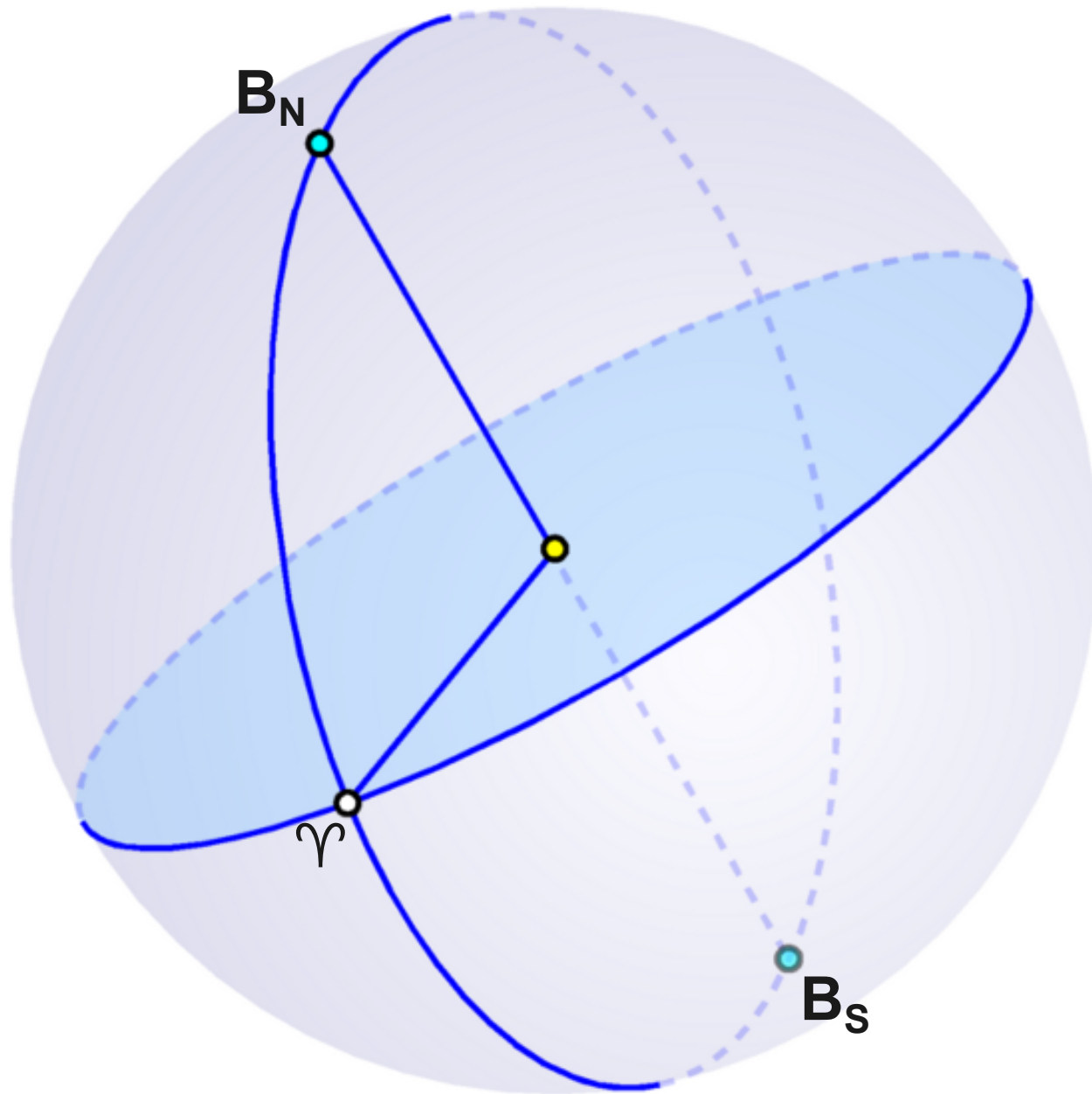


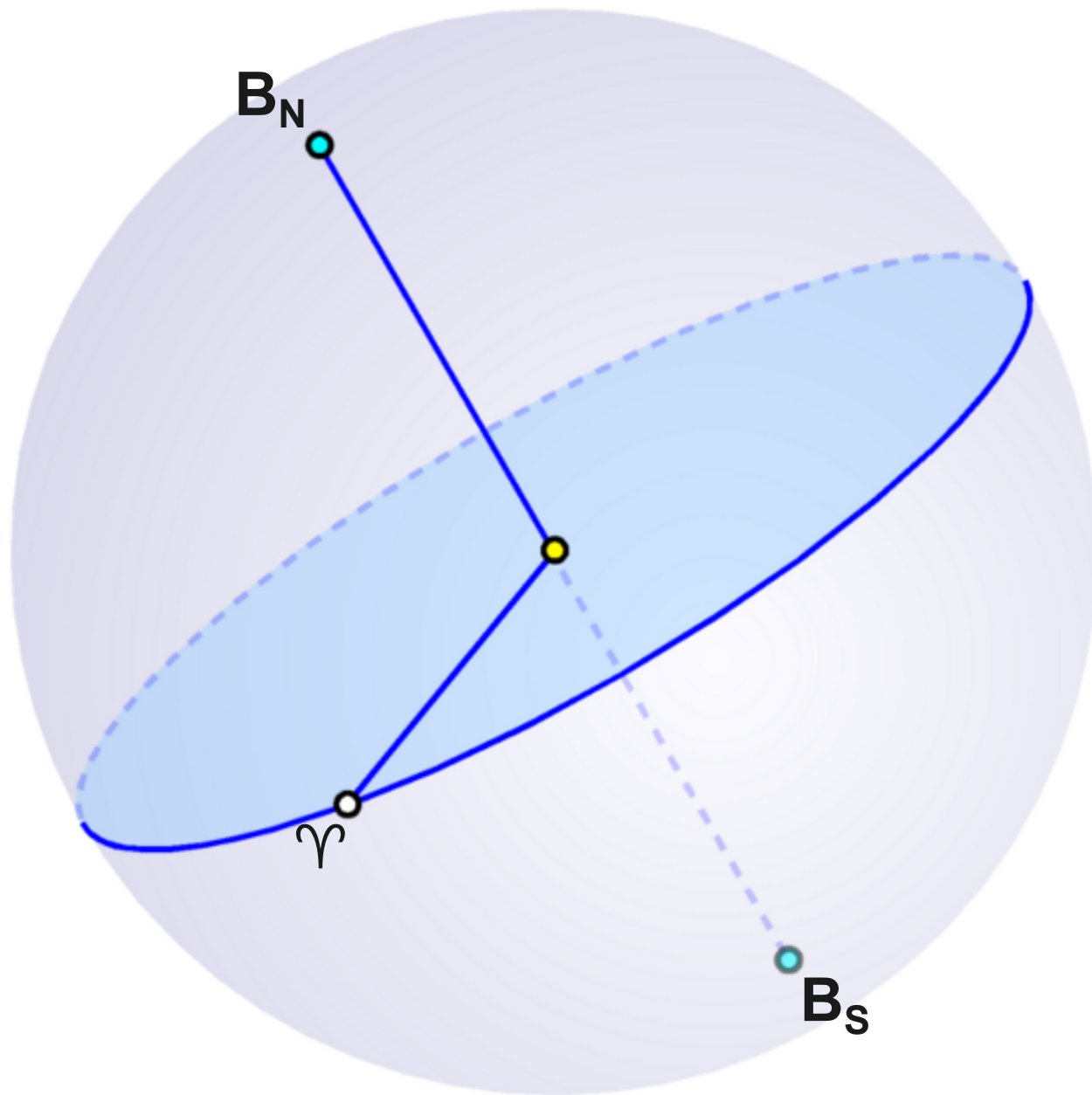
Oto układ
równikowy równonocny...

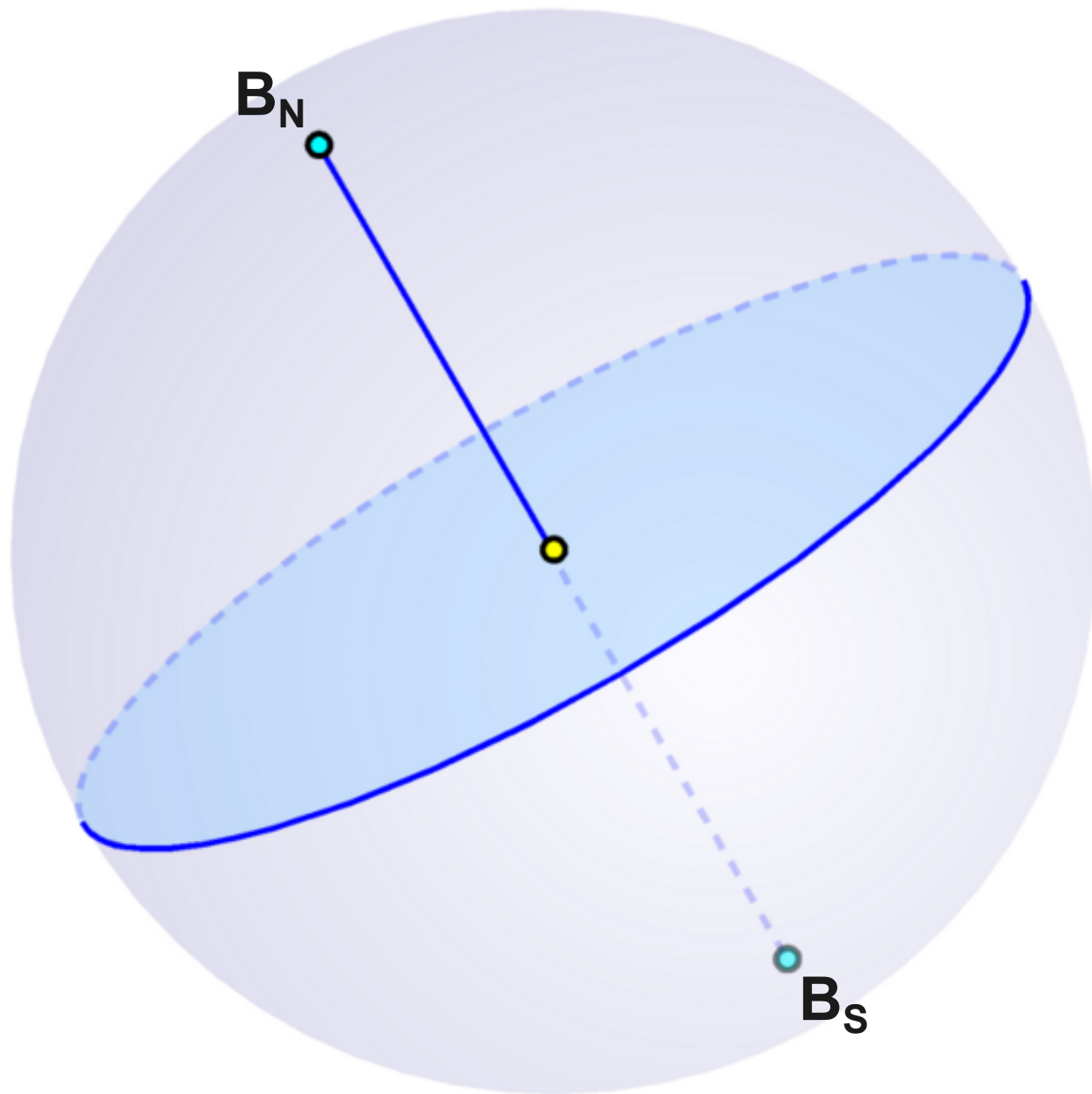


Oto układ
równikowy równonocny...







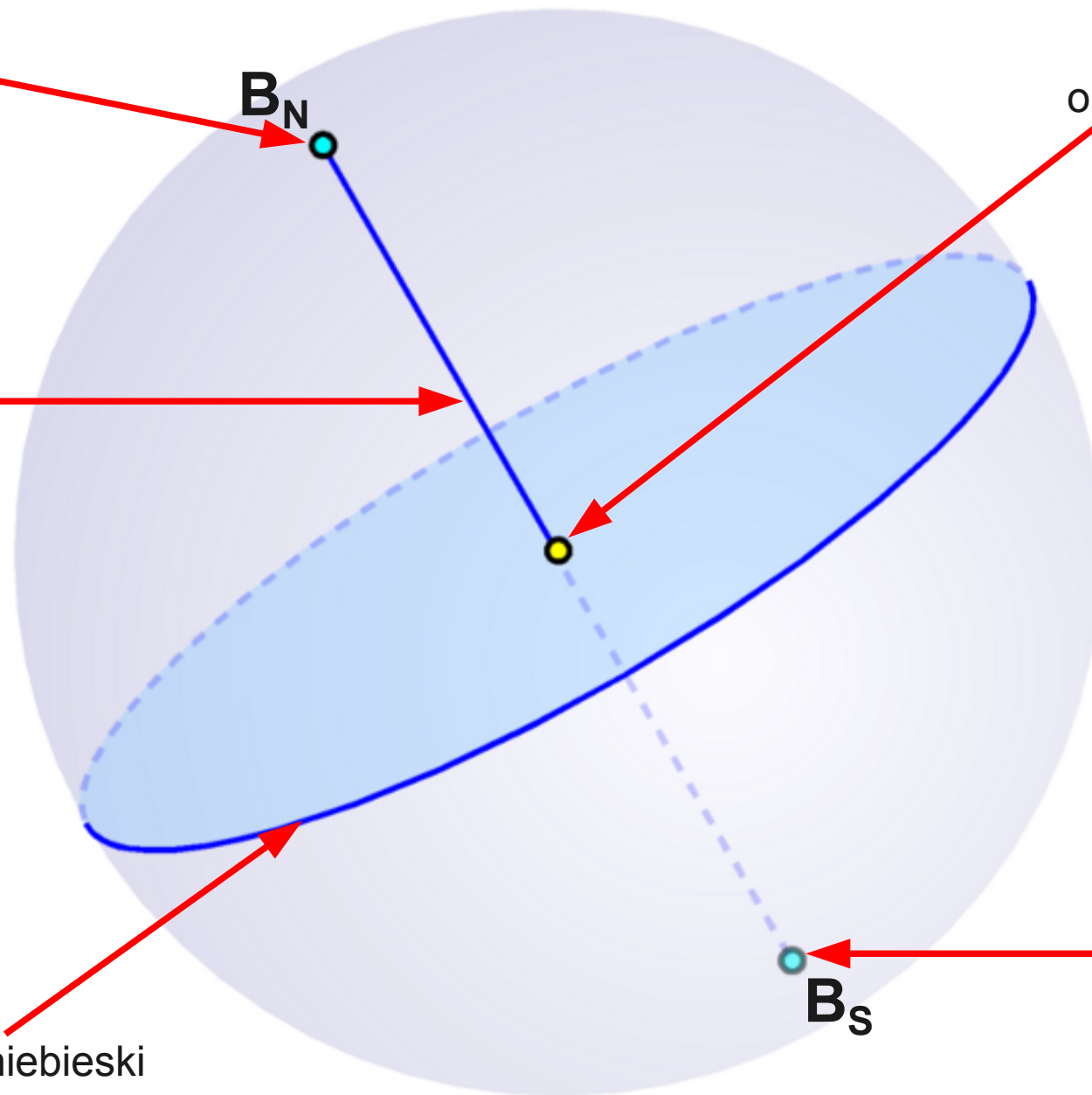


północny
biegun świata

B_N

obserwator

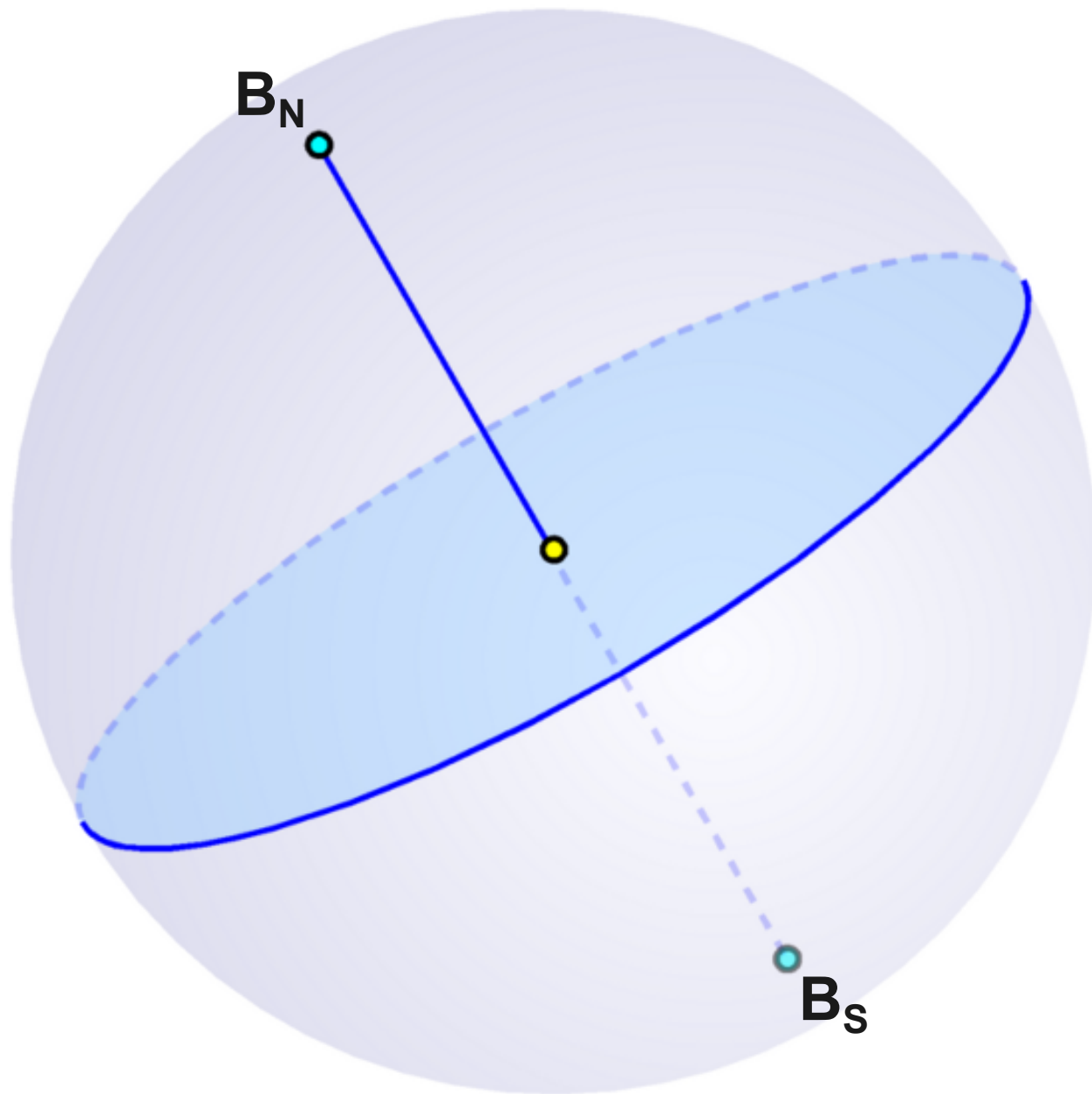
oś świata

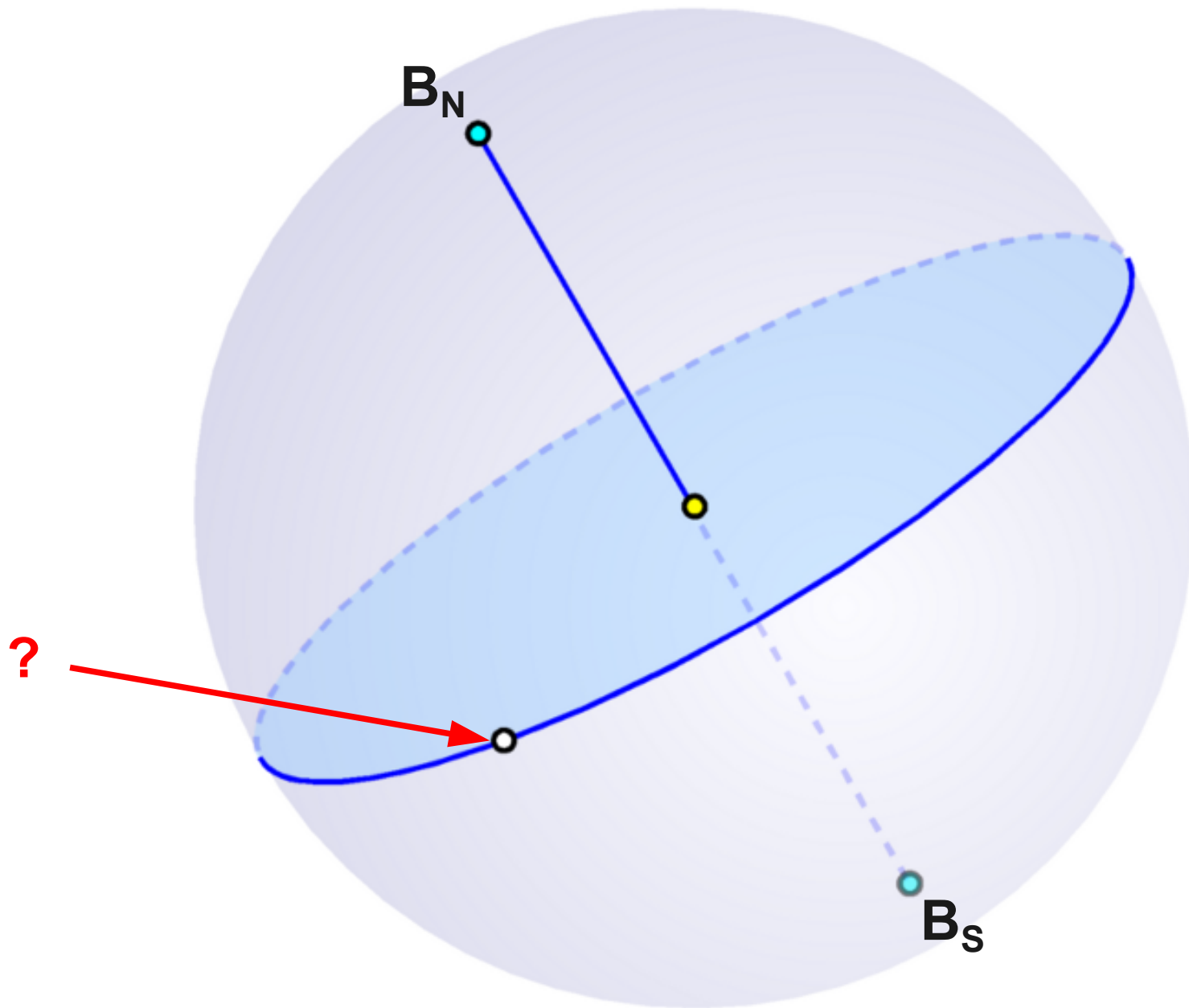


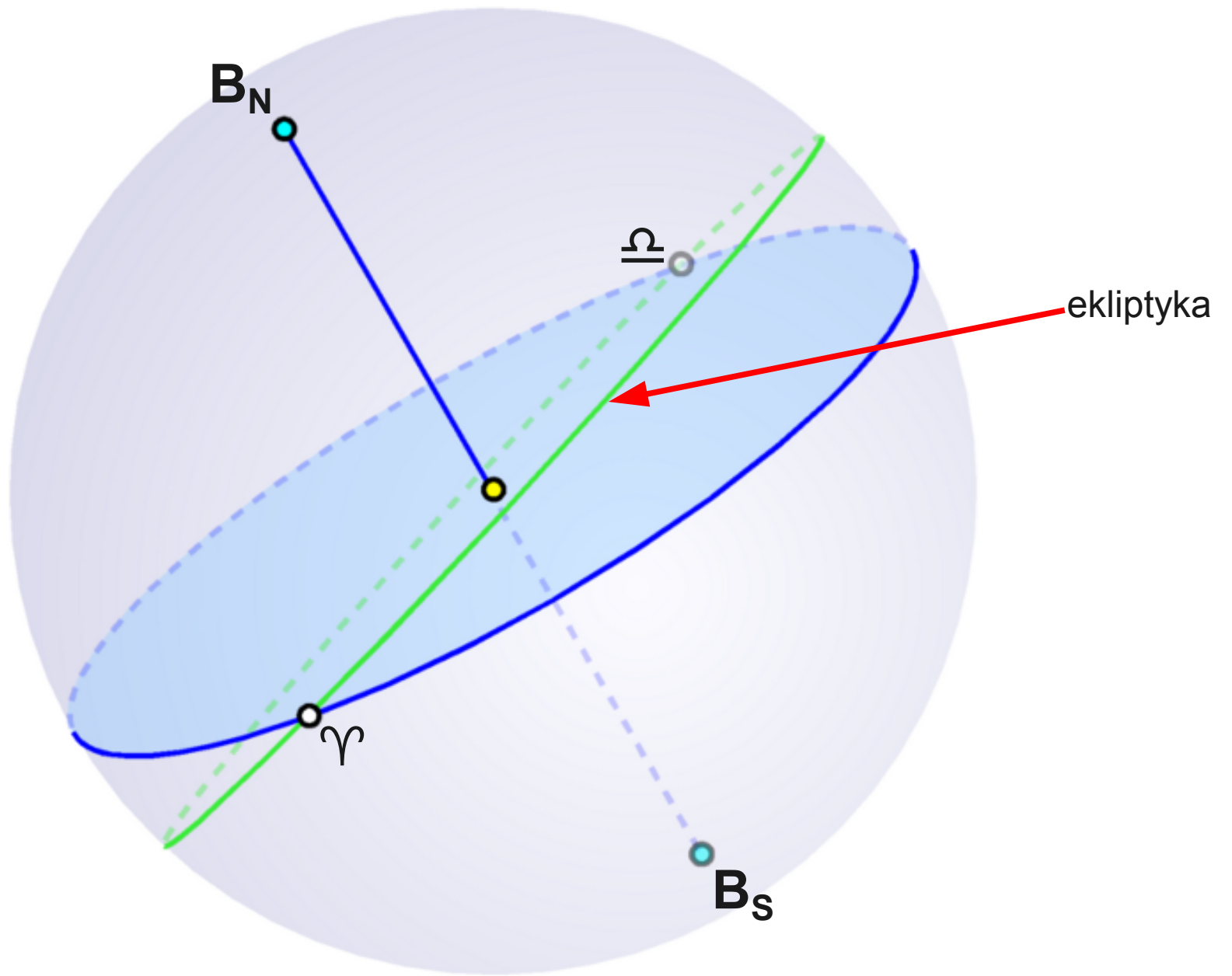
równik niebieski

południowy
biegun świata

B_S

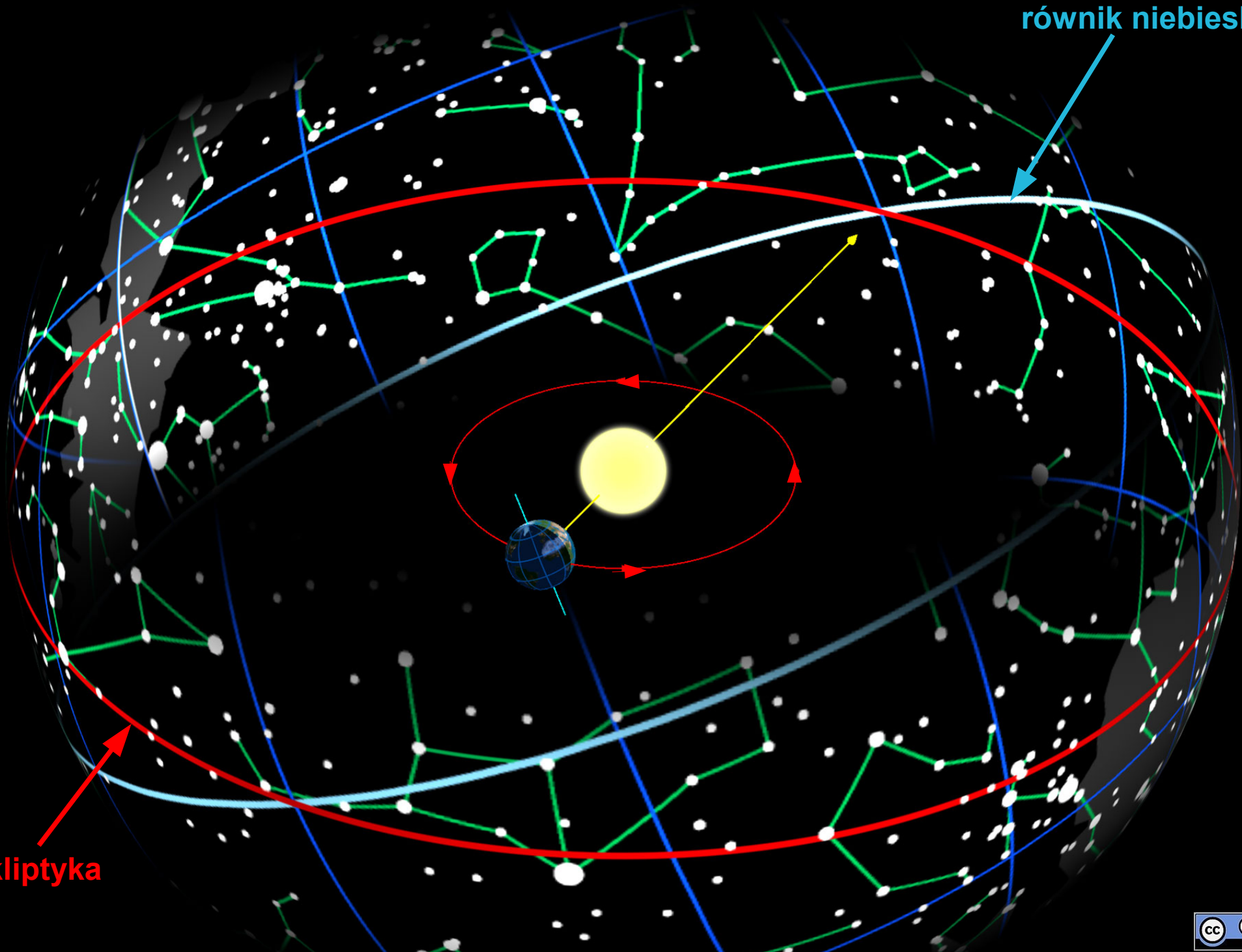




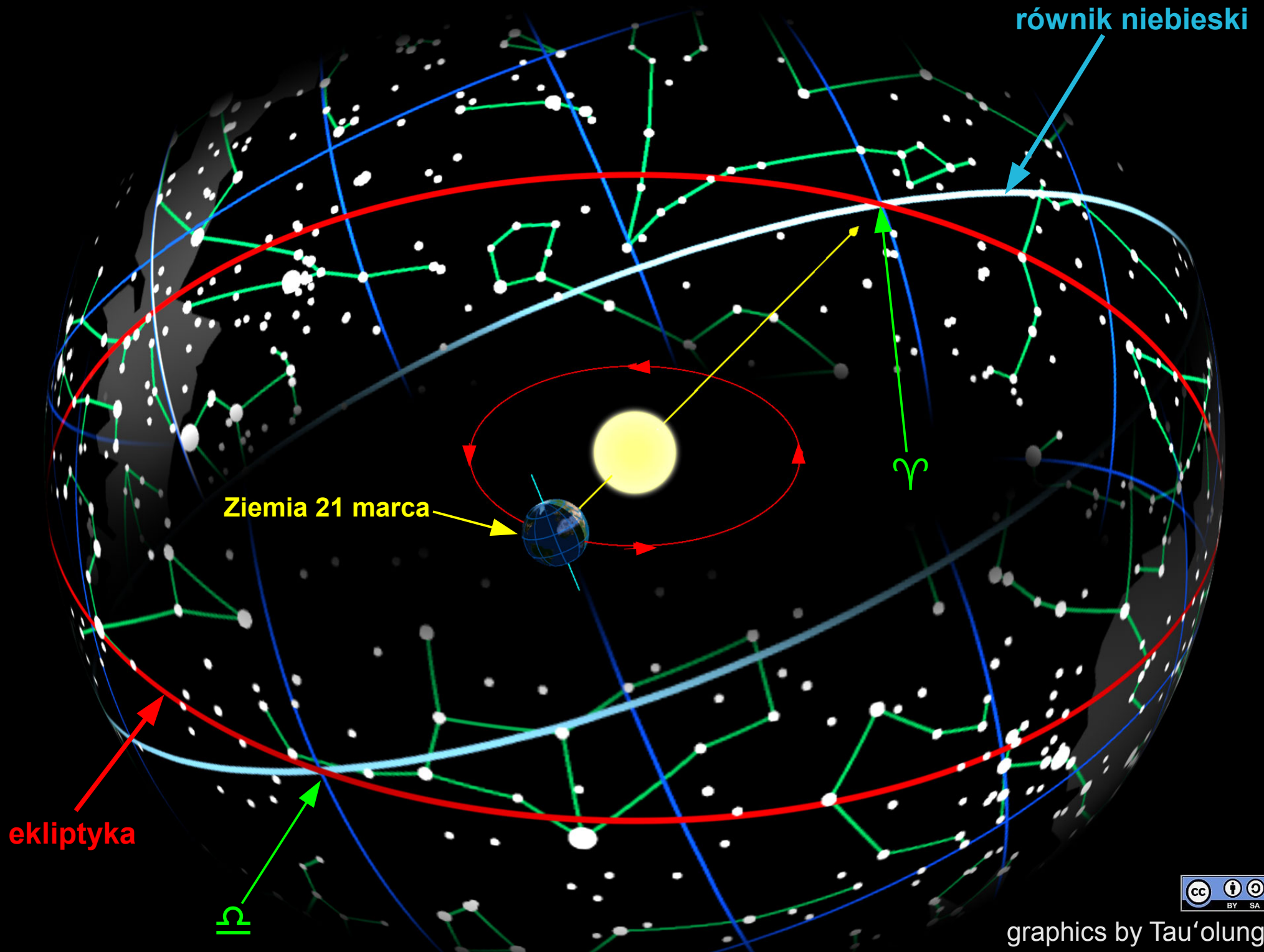


równik niebieski

ekliptyka



graphics by Tau'olunga



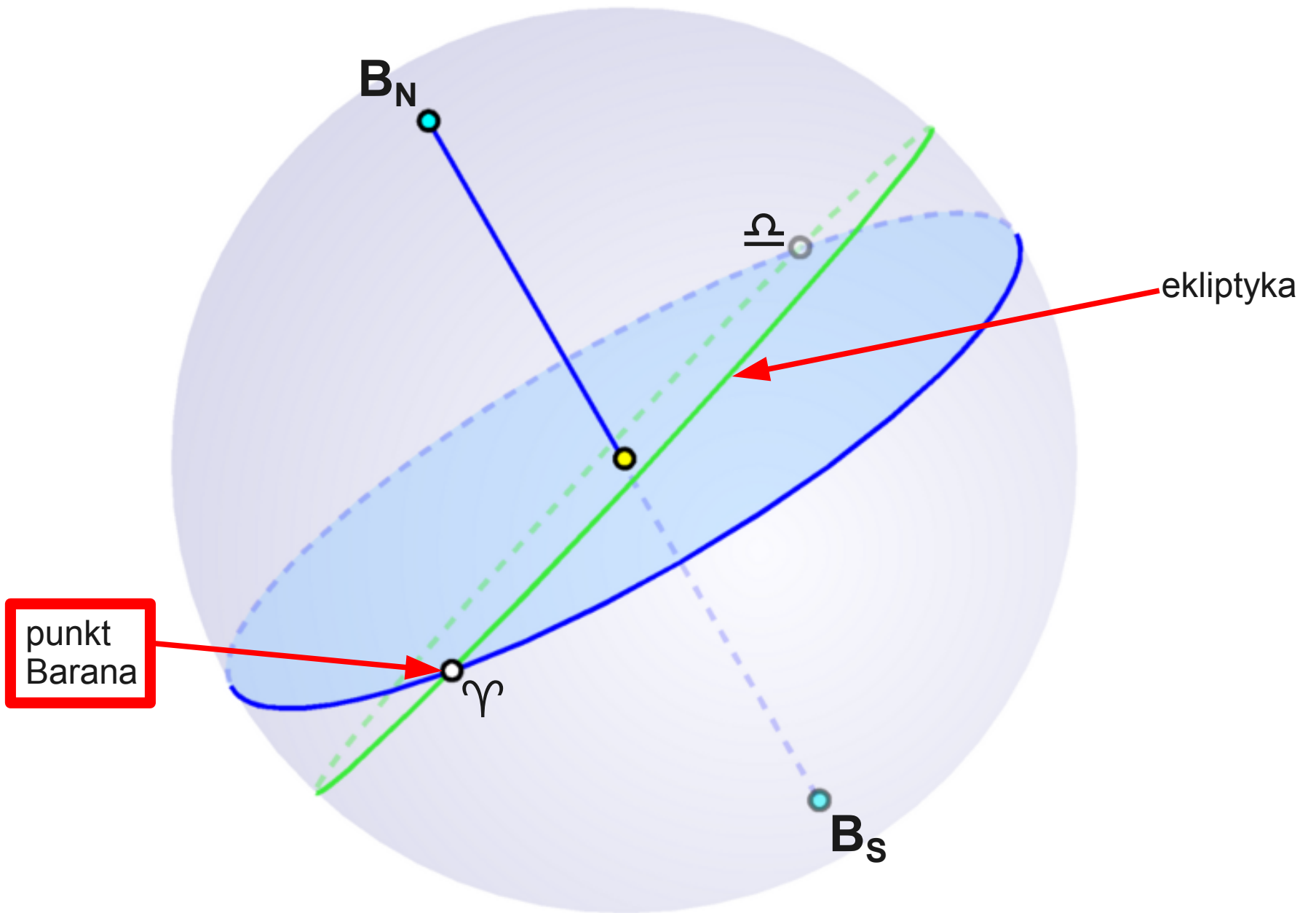
równik niebieski

Ziemia 21 marca

ekliptyka

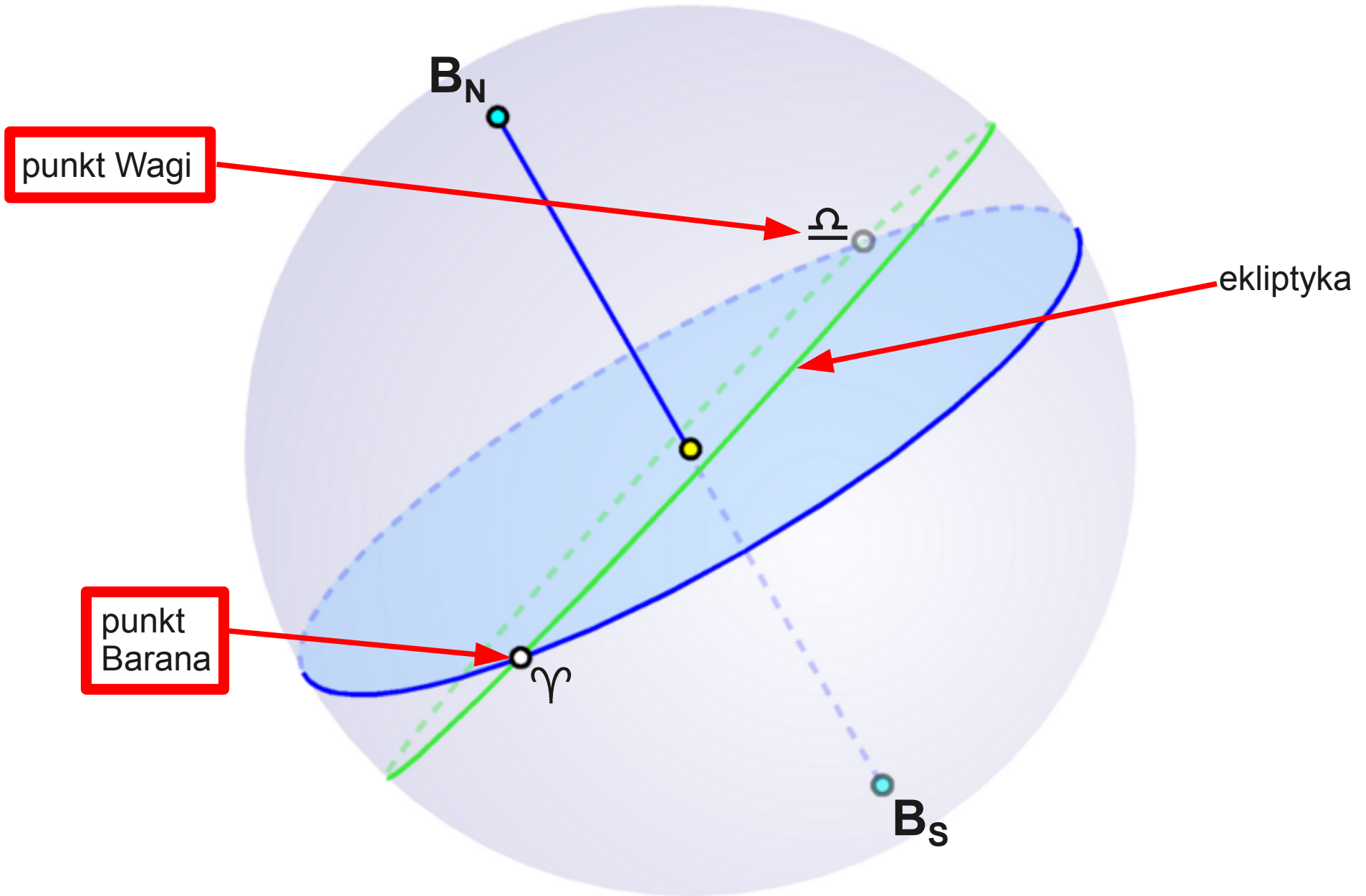


graphics by Tau'olunga



punkt Barana to punkt równonocy wiosennej

punkt Wagi to punkt równonocy jesiennej



punkt Barana to punkt równonocy wiosennej

północny
biegun świata

B_N

obserwator

oś świata

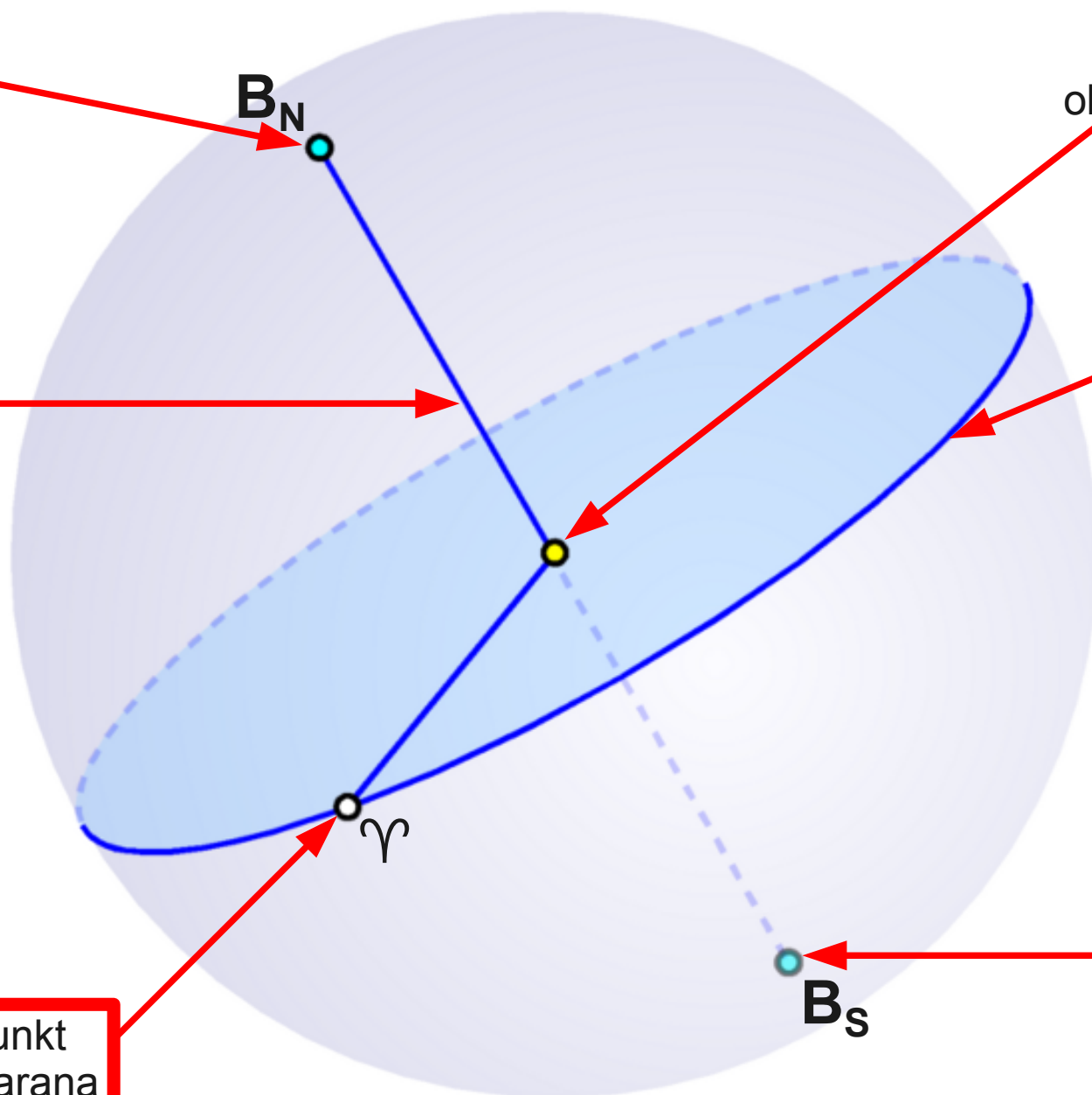
równik niebieski

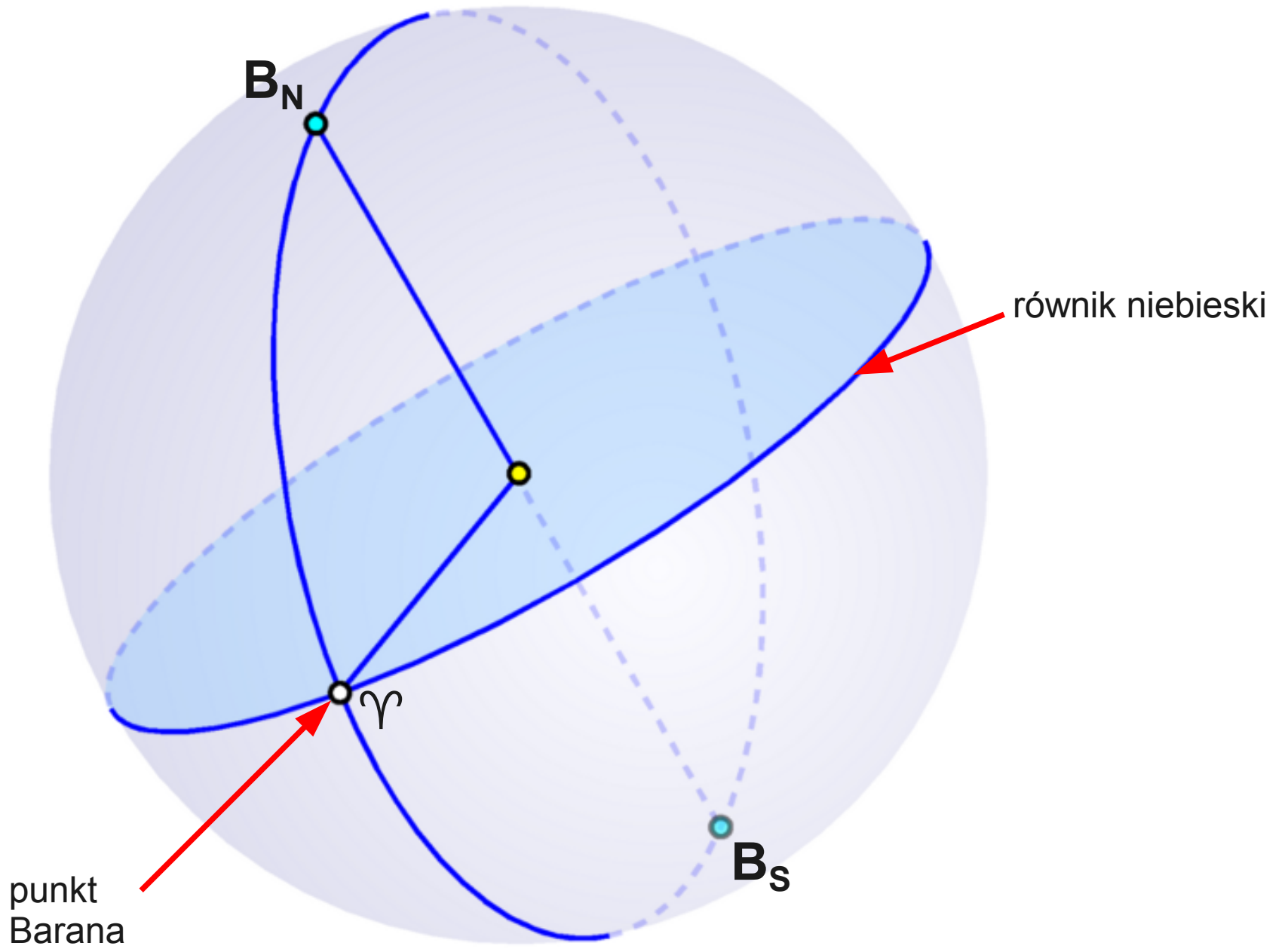
punkt
Barana

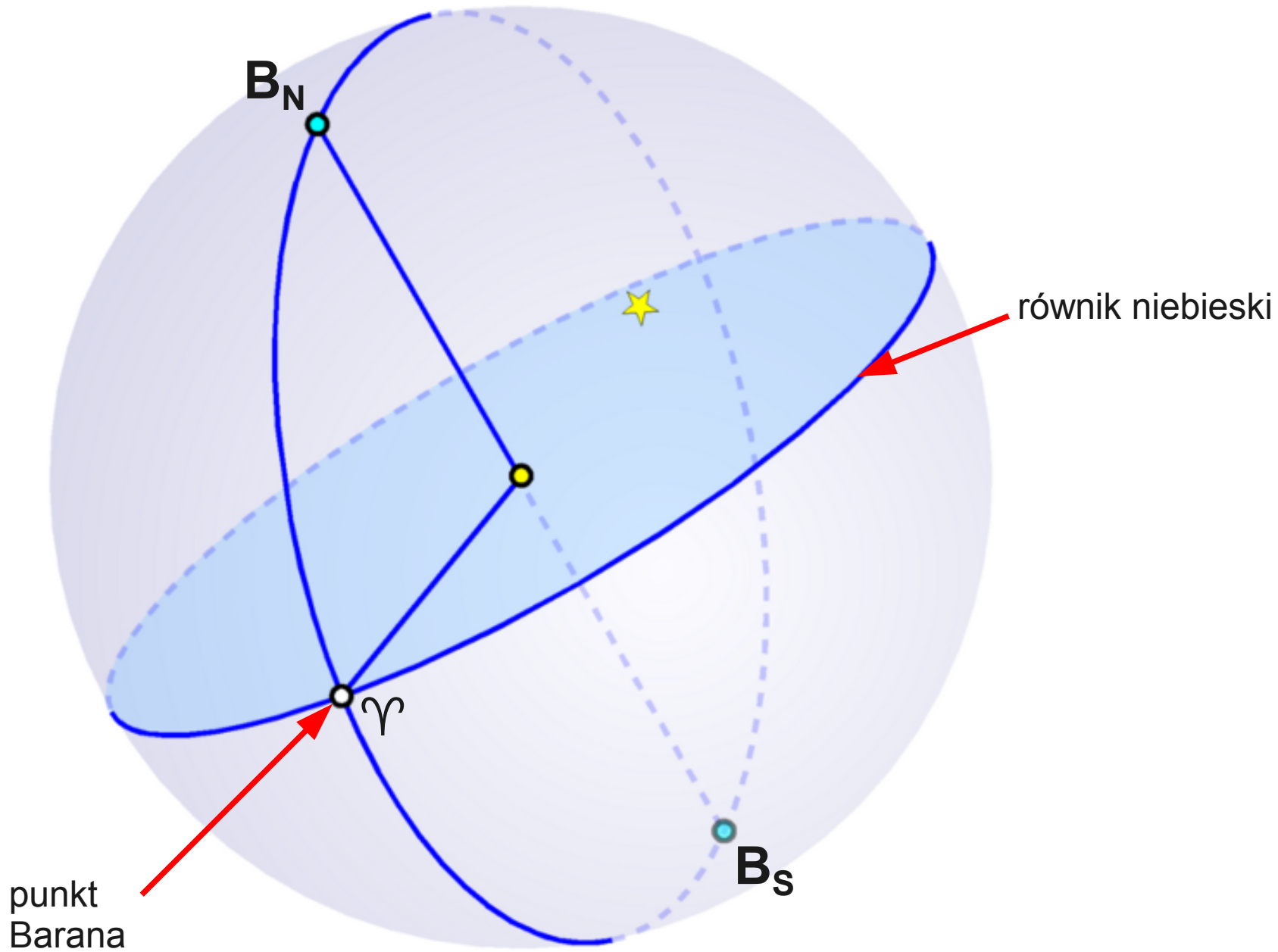
γ

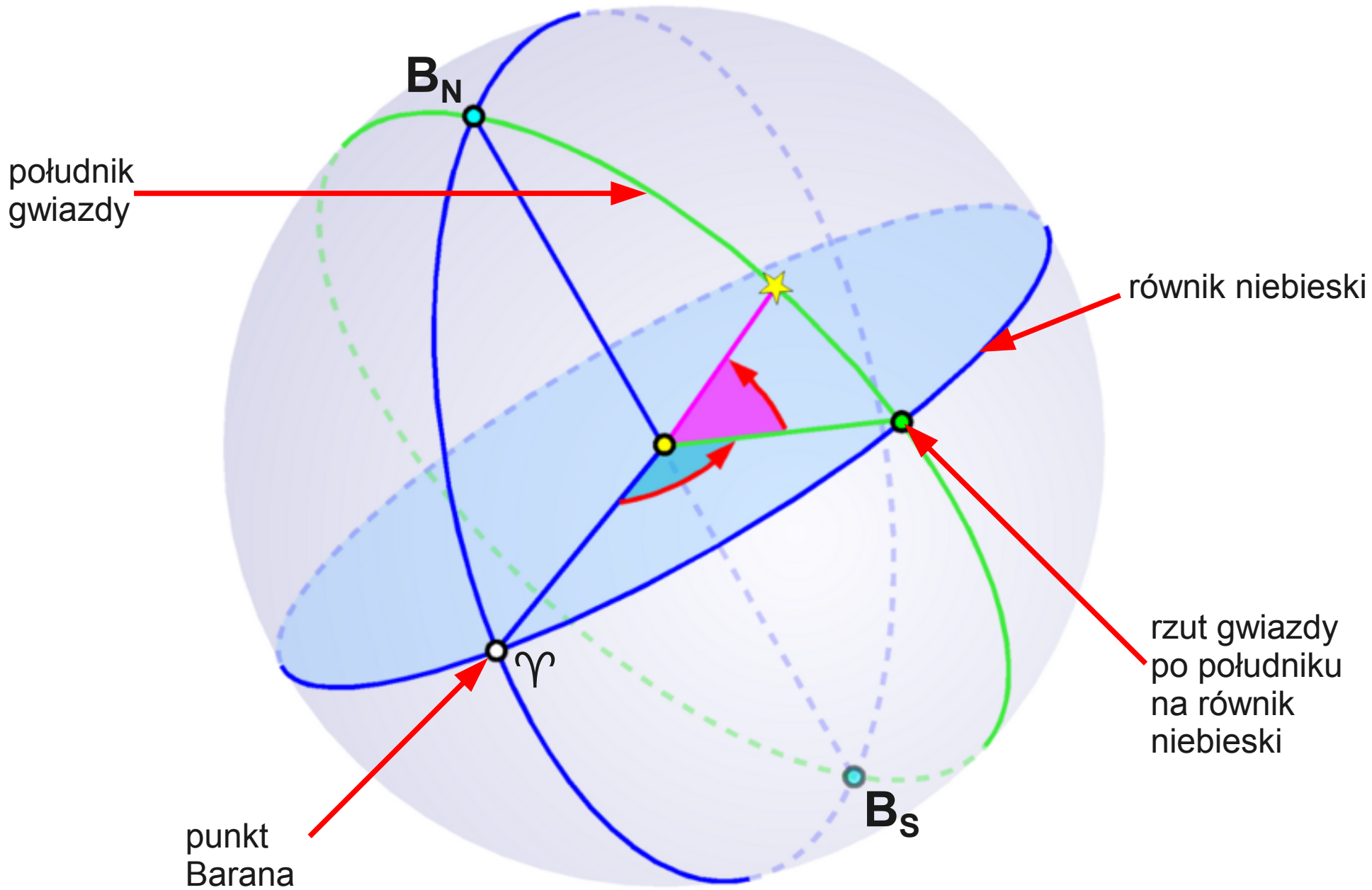
południowy
biegun świata

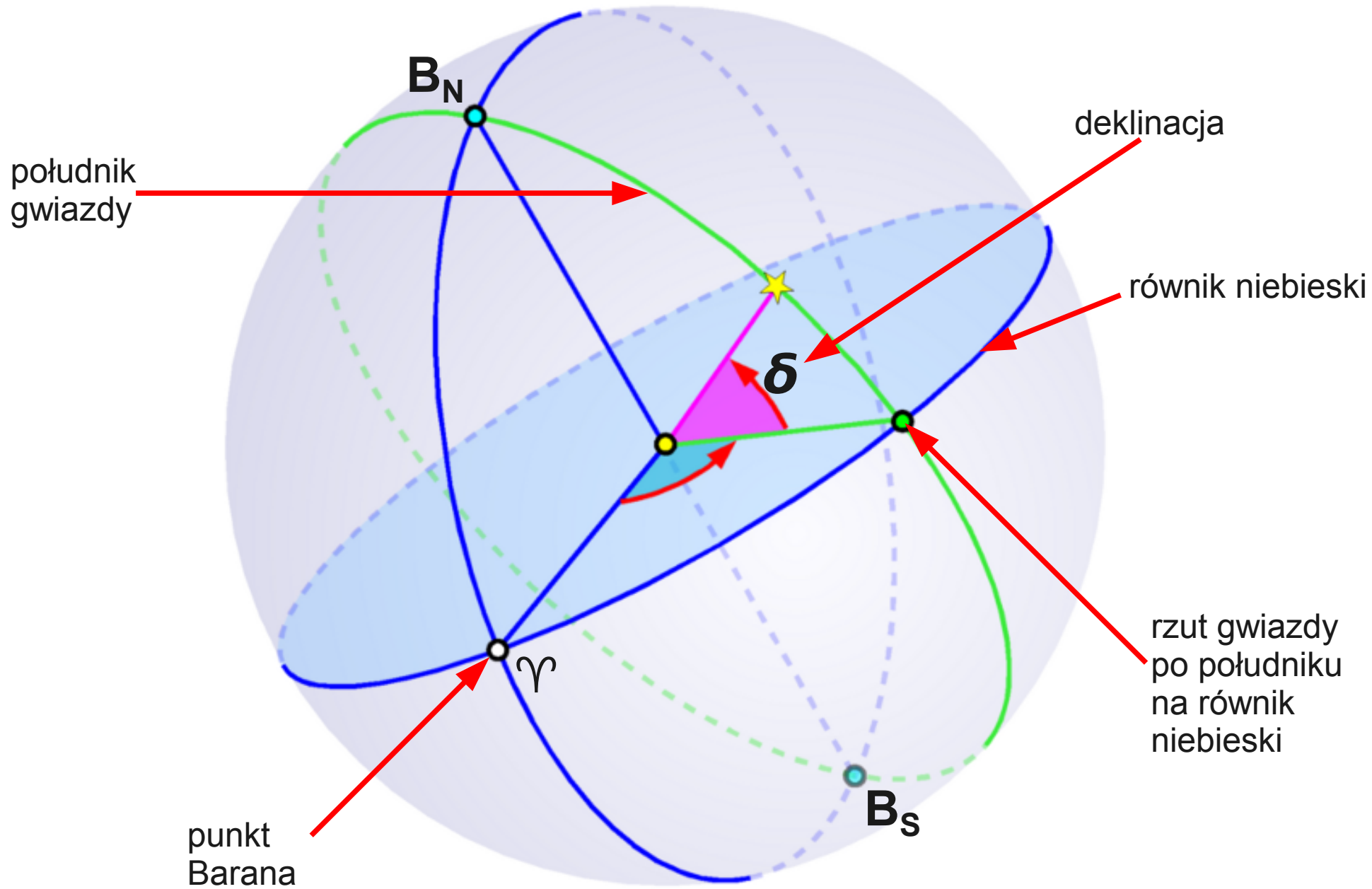
B_S



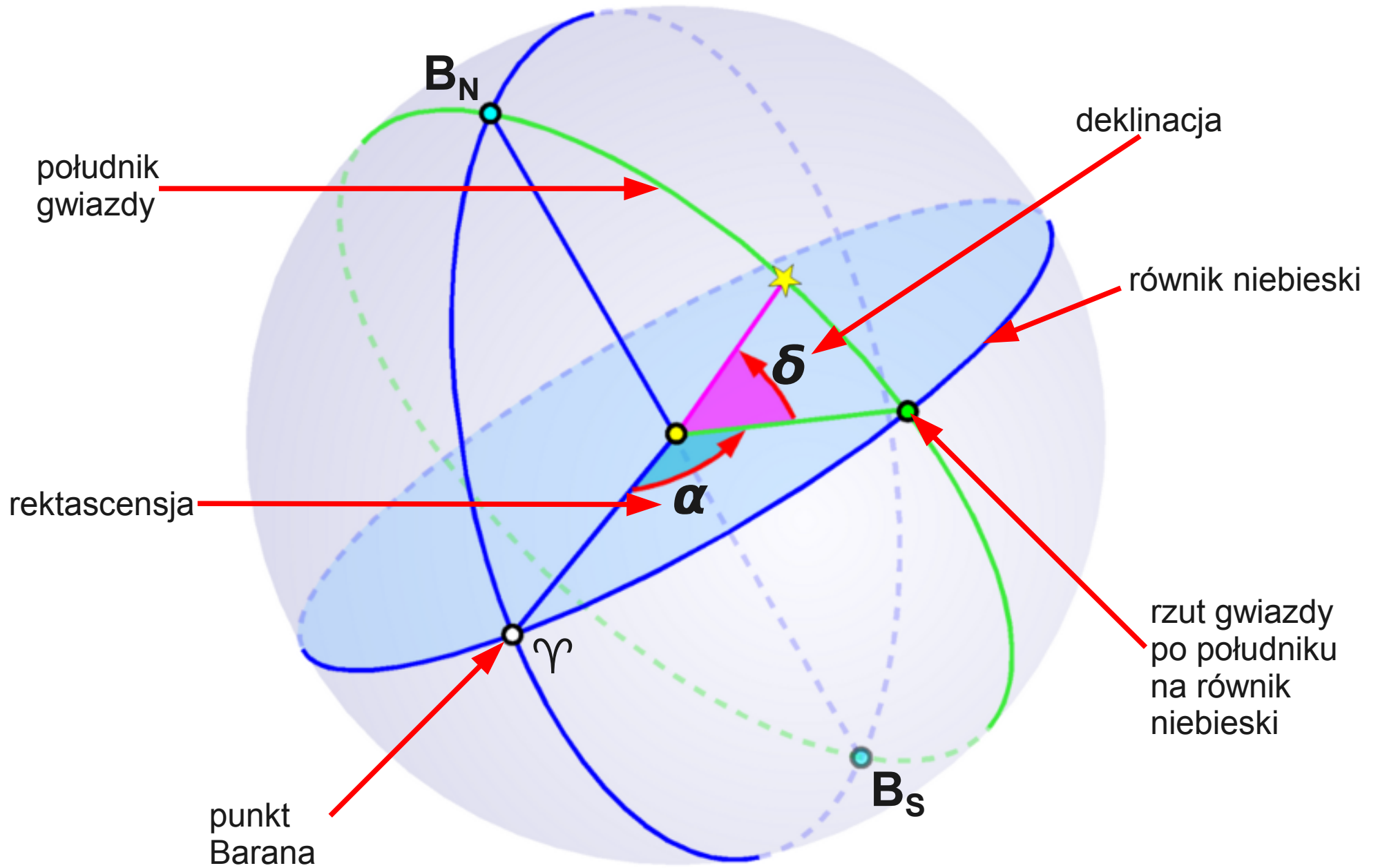




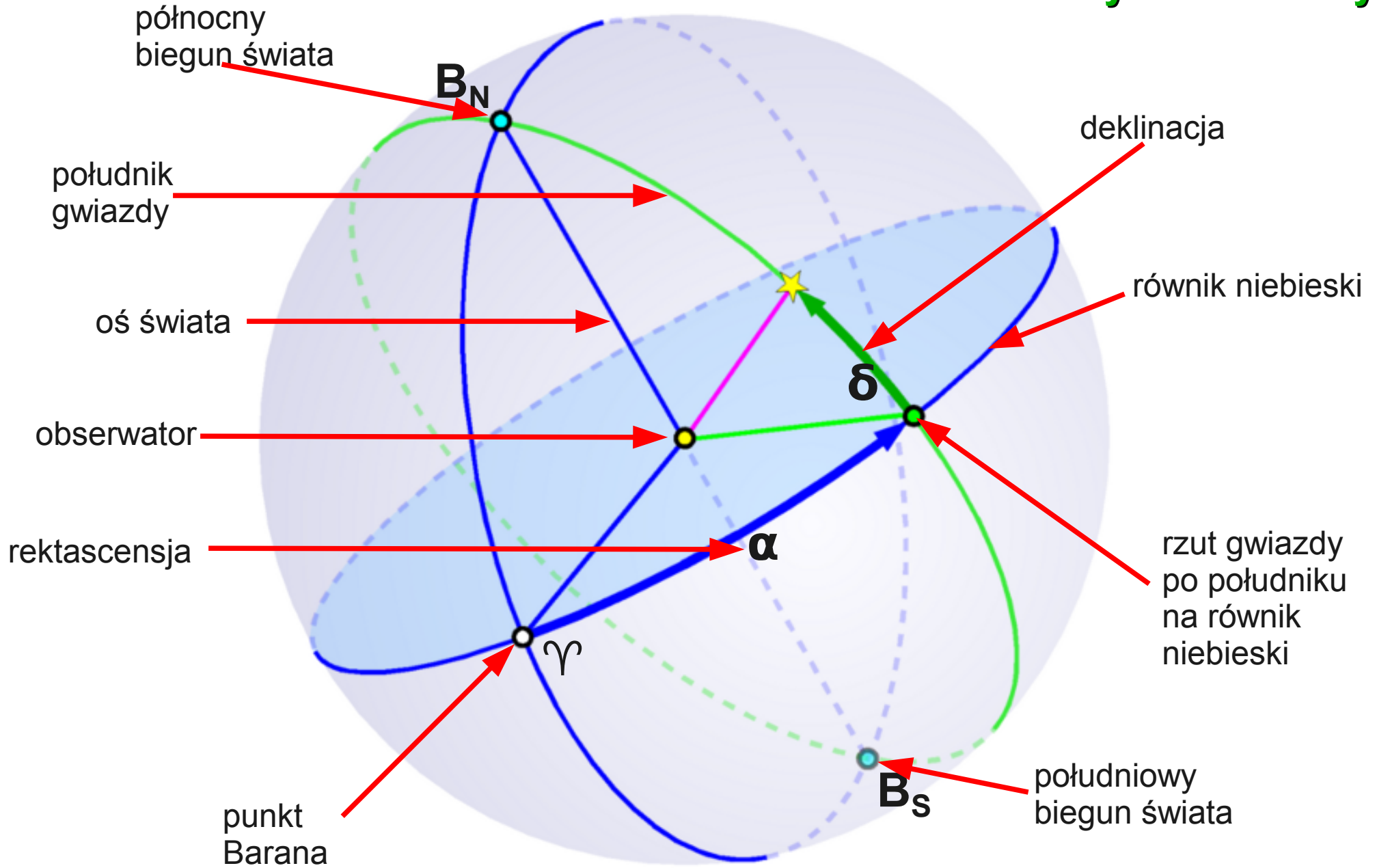


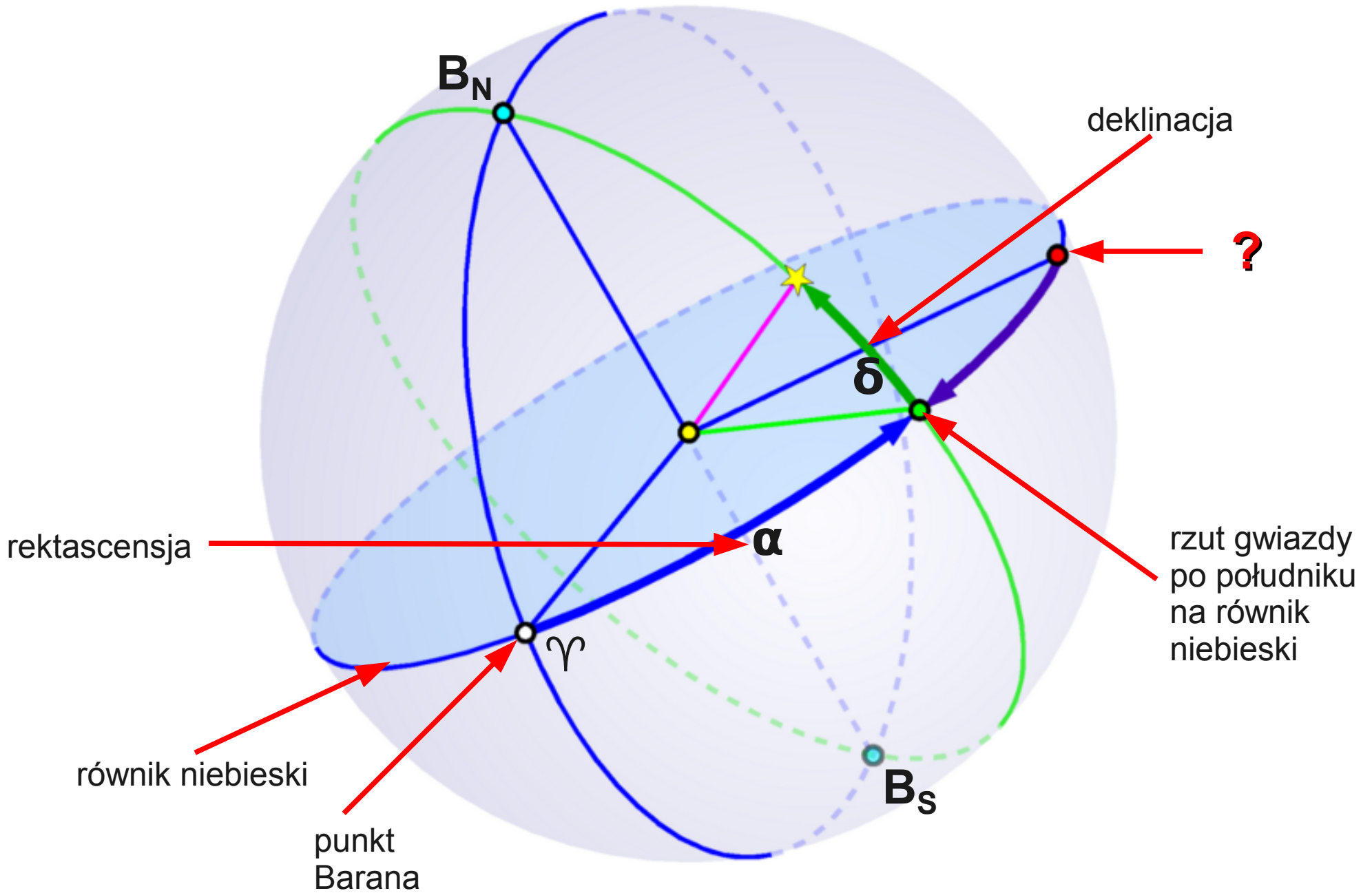


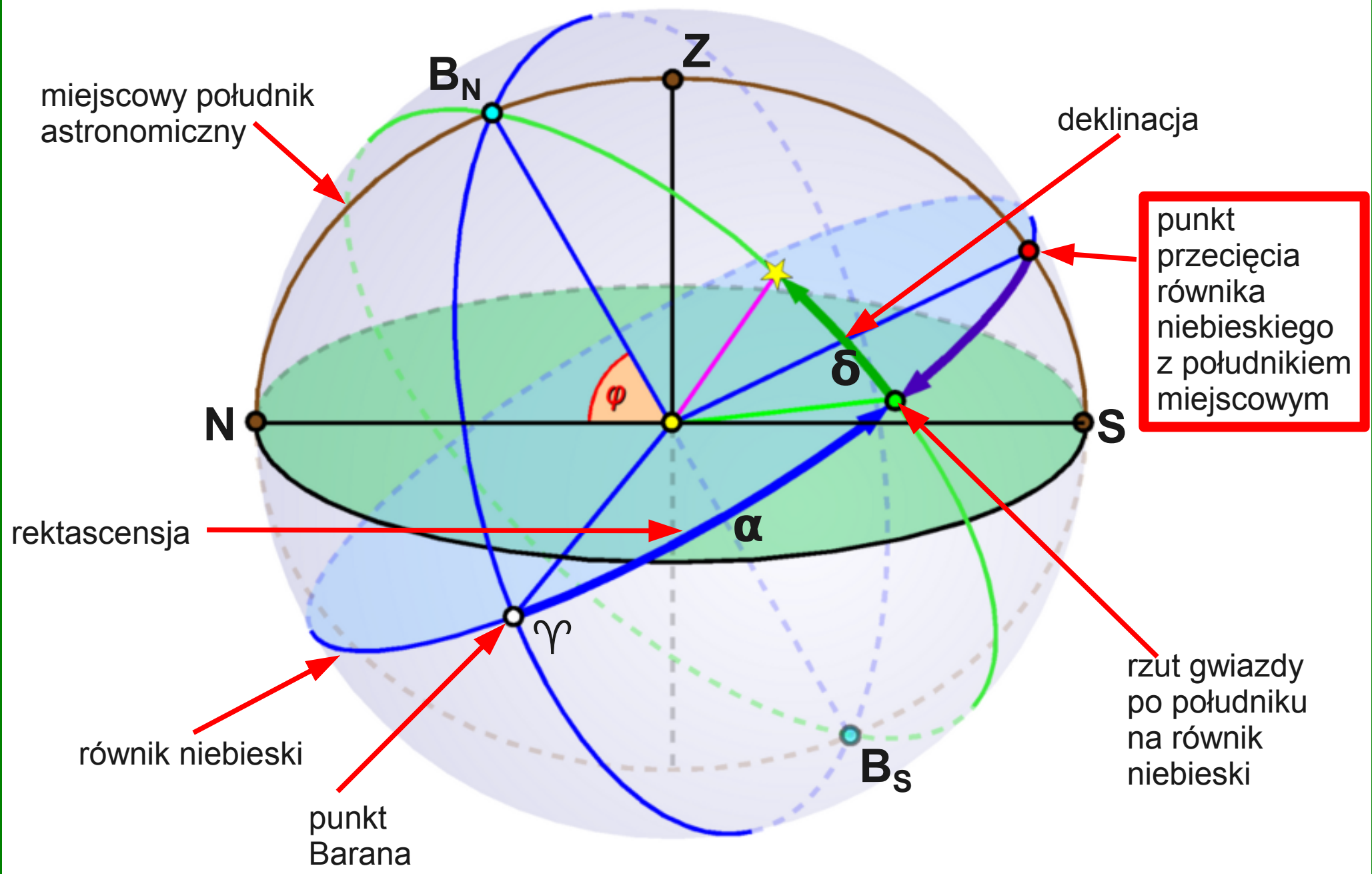
Układ równikowy równonocny



Układ równikowy równonocny







miejscowy południk
astronomiczny

deklinacja

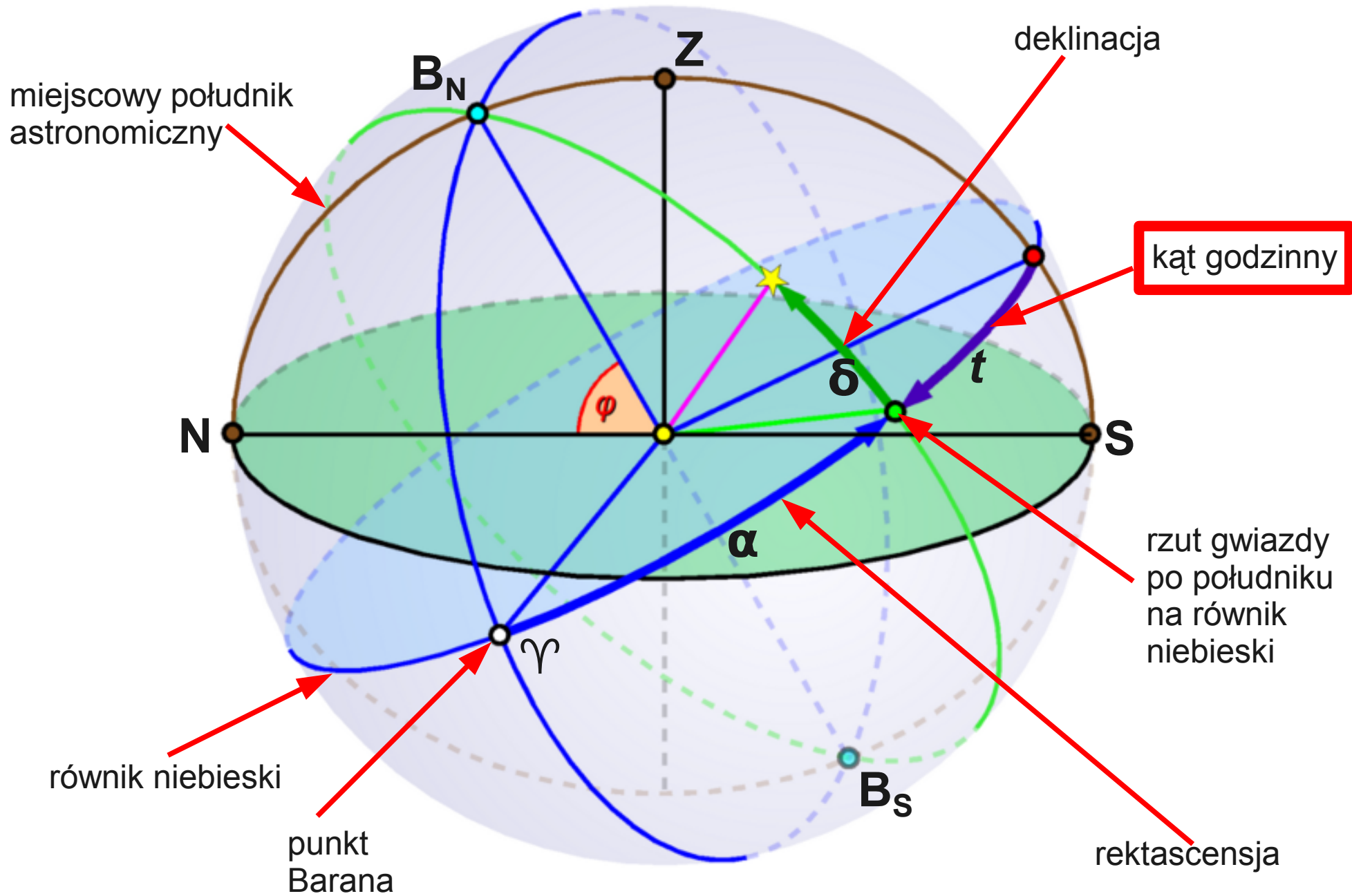
punkt
przecięcia
równika
niebieskiego
z południkiem
miejscowym

rektascensja

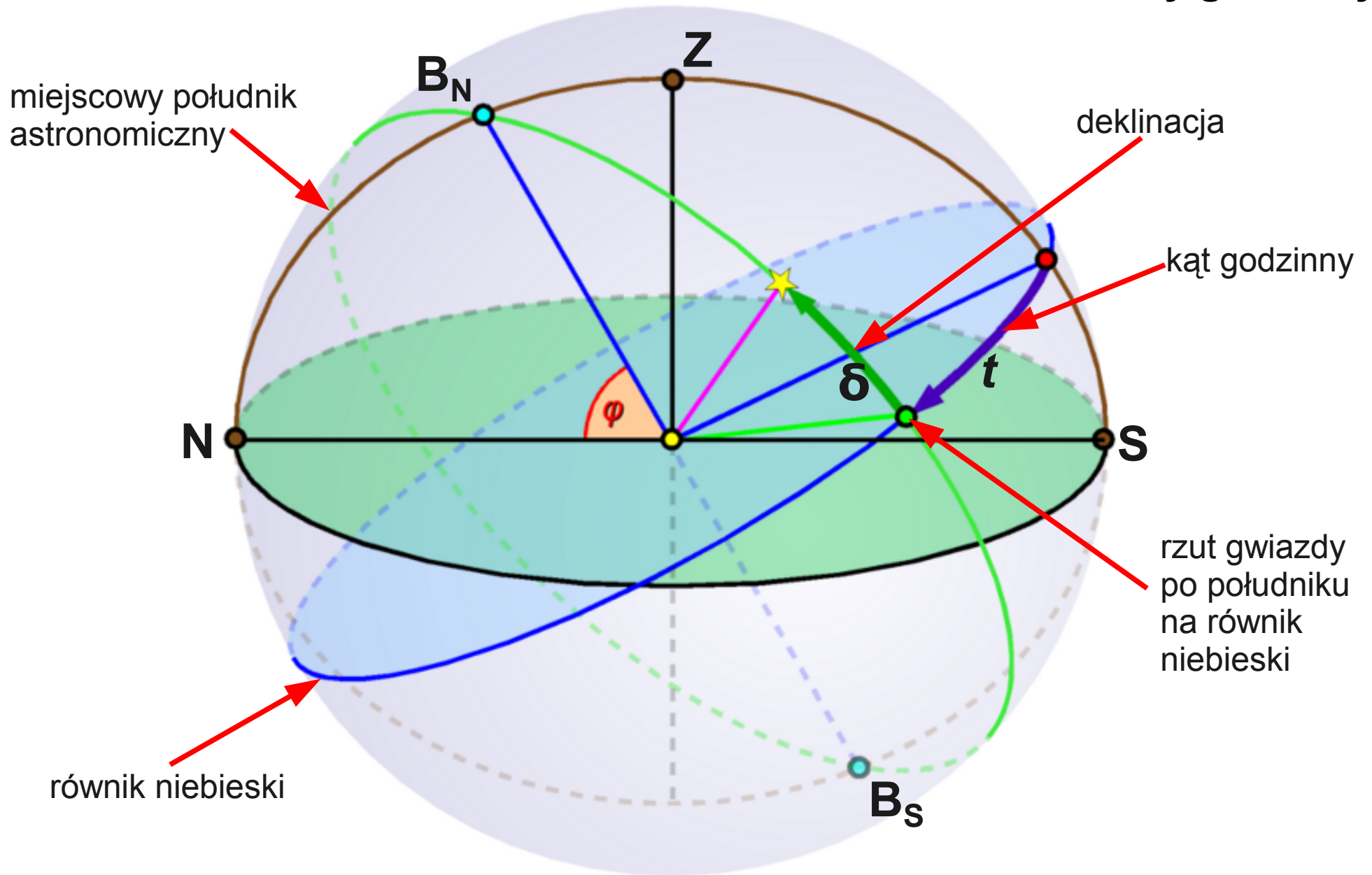
równik niebieski

punkt
Barana

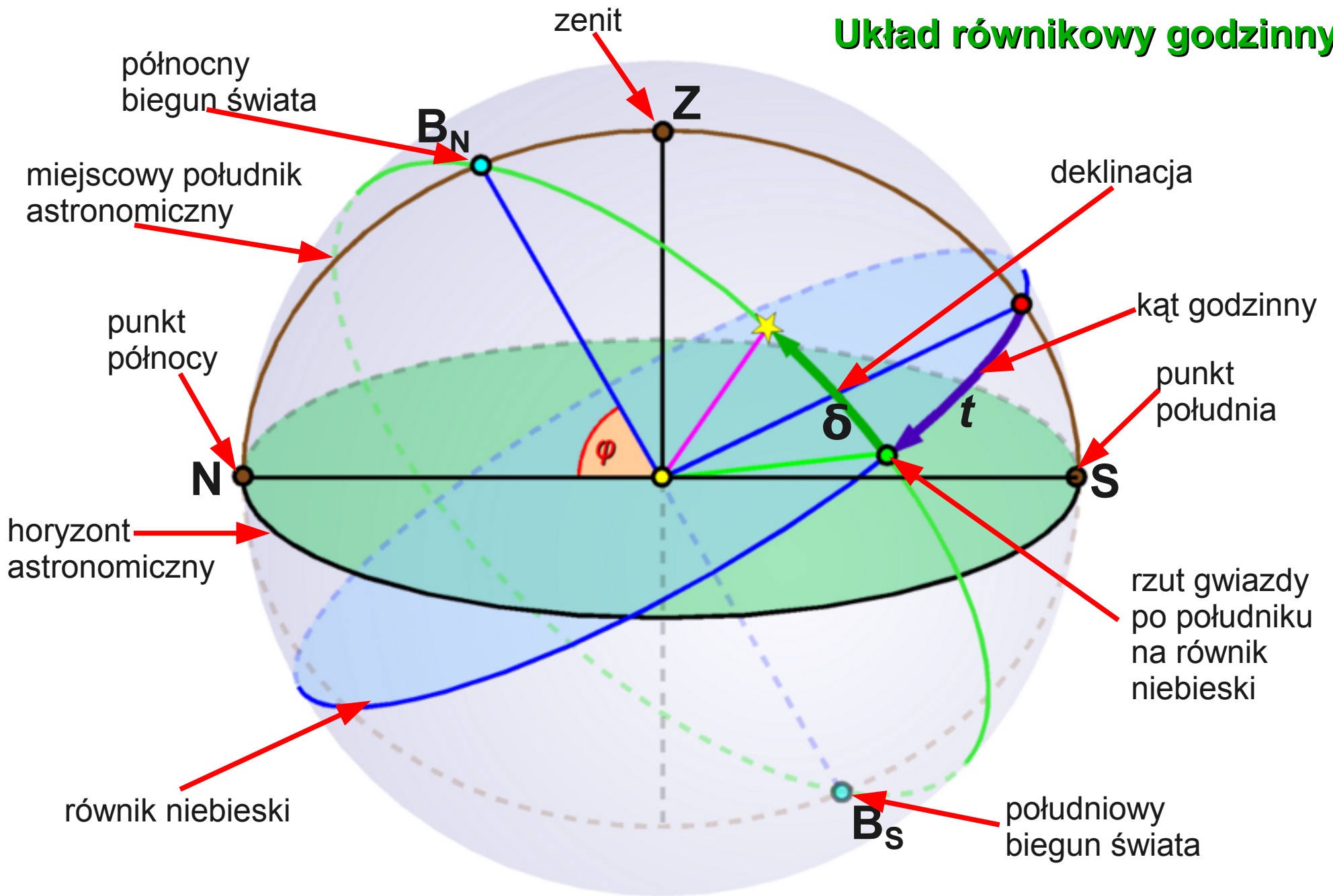
rzut gwiazdy
po południku
na równik
niebieski



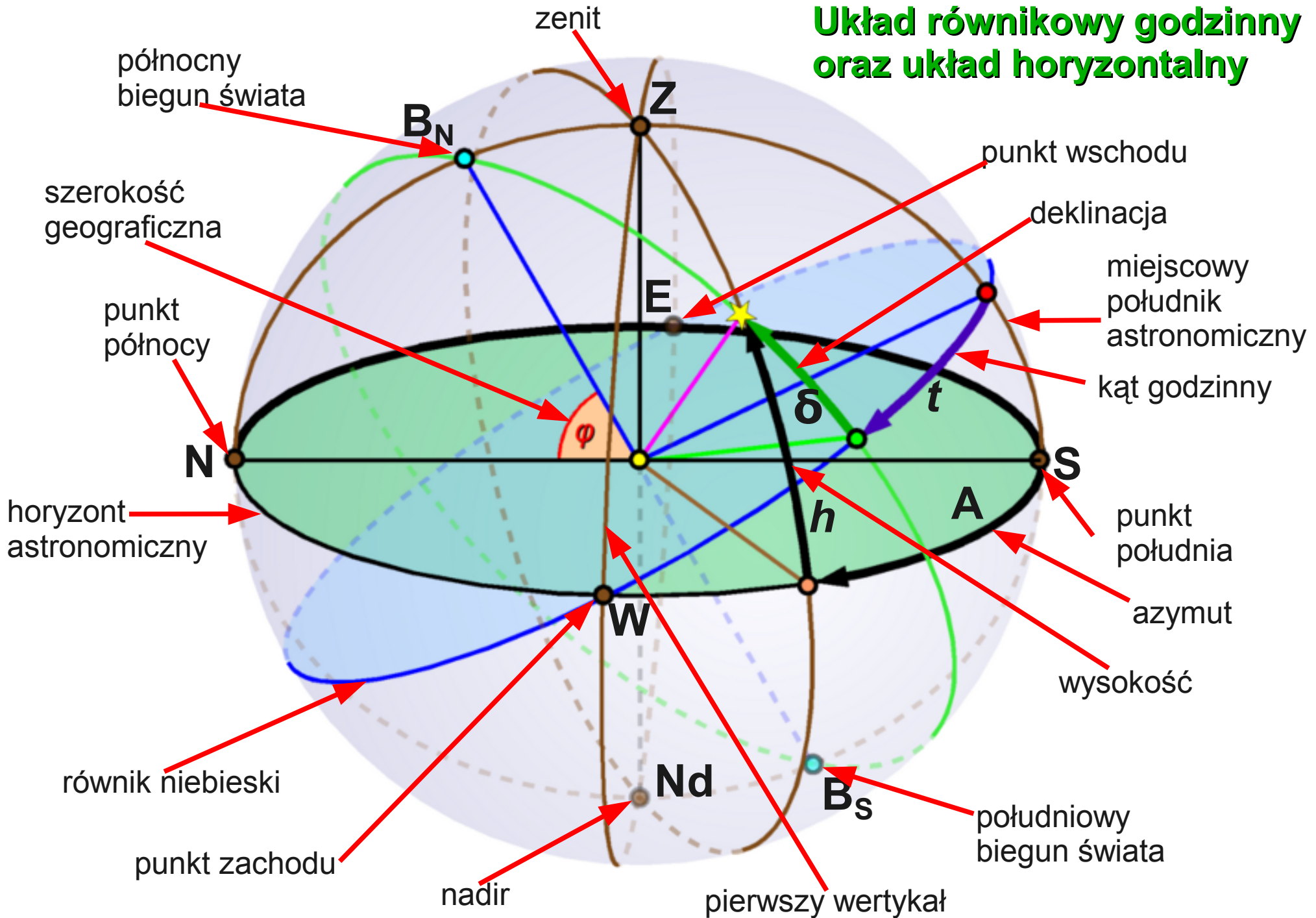
Układ równikowy godzinny

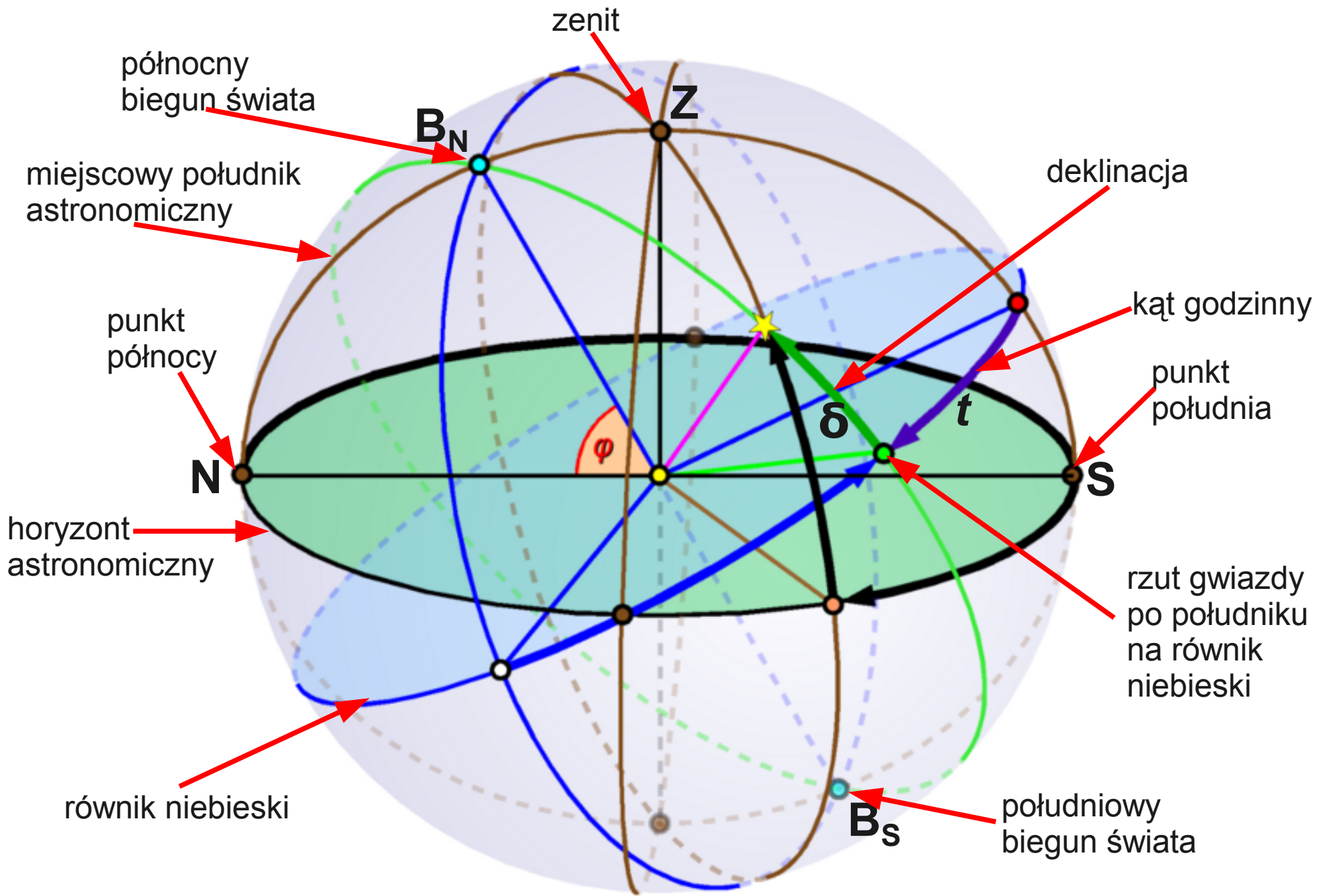


Układ równikowy godzinny

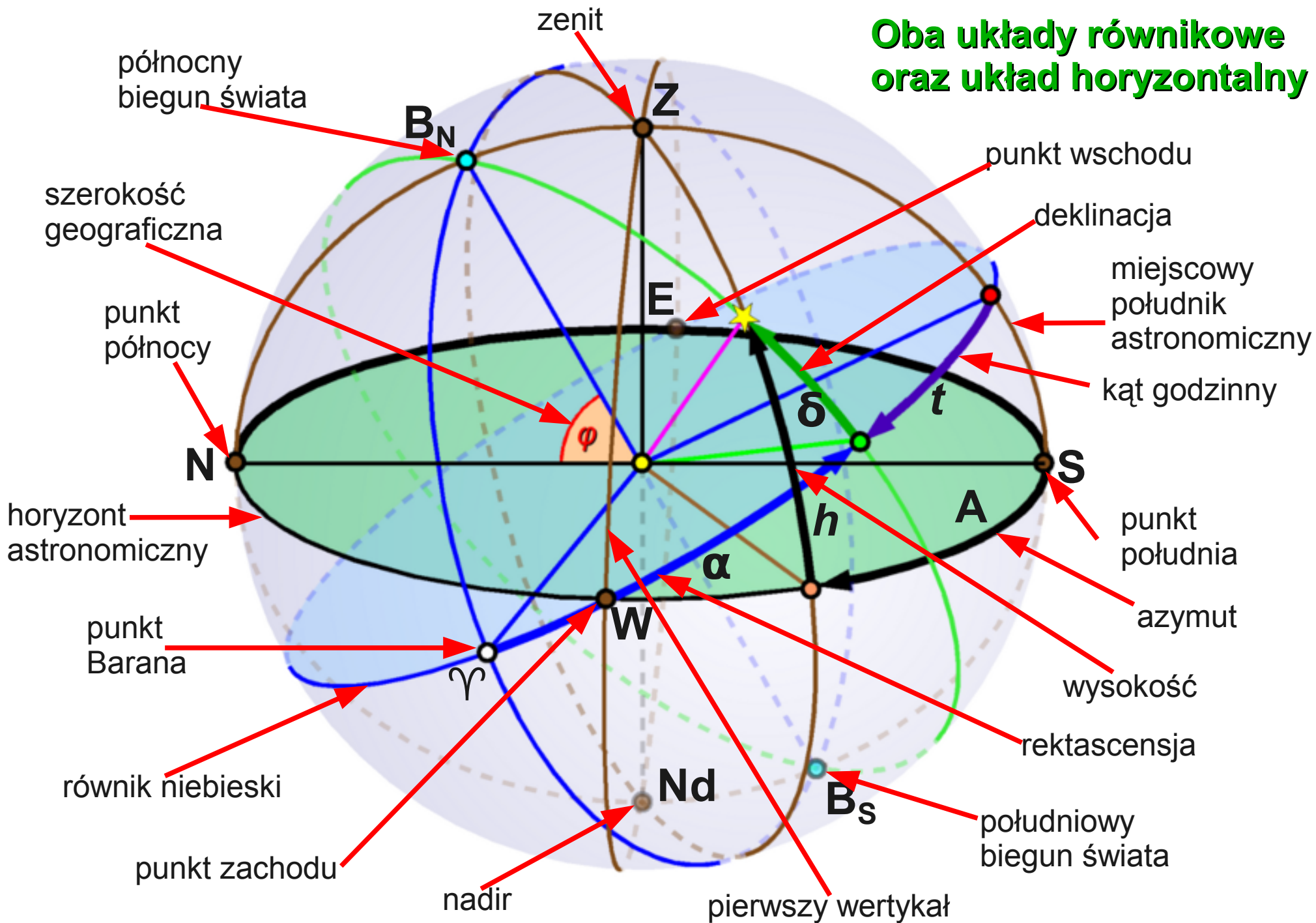


Układ równikowy godzinny oraz układ horyzontalny





Oba układy równikowe oraz układ horyzontalny



Miara czasowa kątów

- $360^\circ = 24^h$
- $15^\circ = 1^h = 60^m$
- $1^\circ = 4^m$
- $60' = 4^m$
- $15' = 1^m = 60^s$
- $1' = 4^s$
- $60'' = 4^s$
- $15'' = 1^s$

Spójrzmy na niebo ...



15 października 2013, 24:00



15 października 2013, 24:00



15 października 2013, 24:00

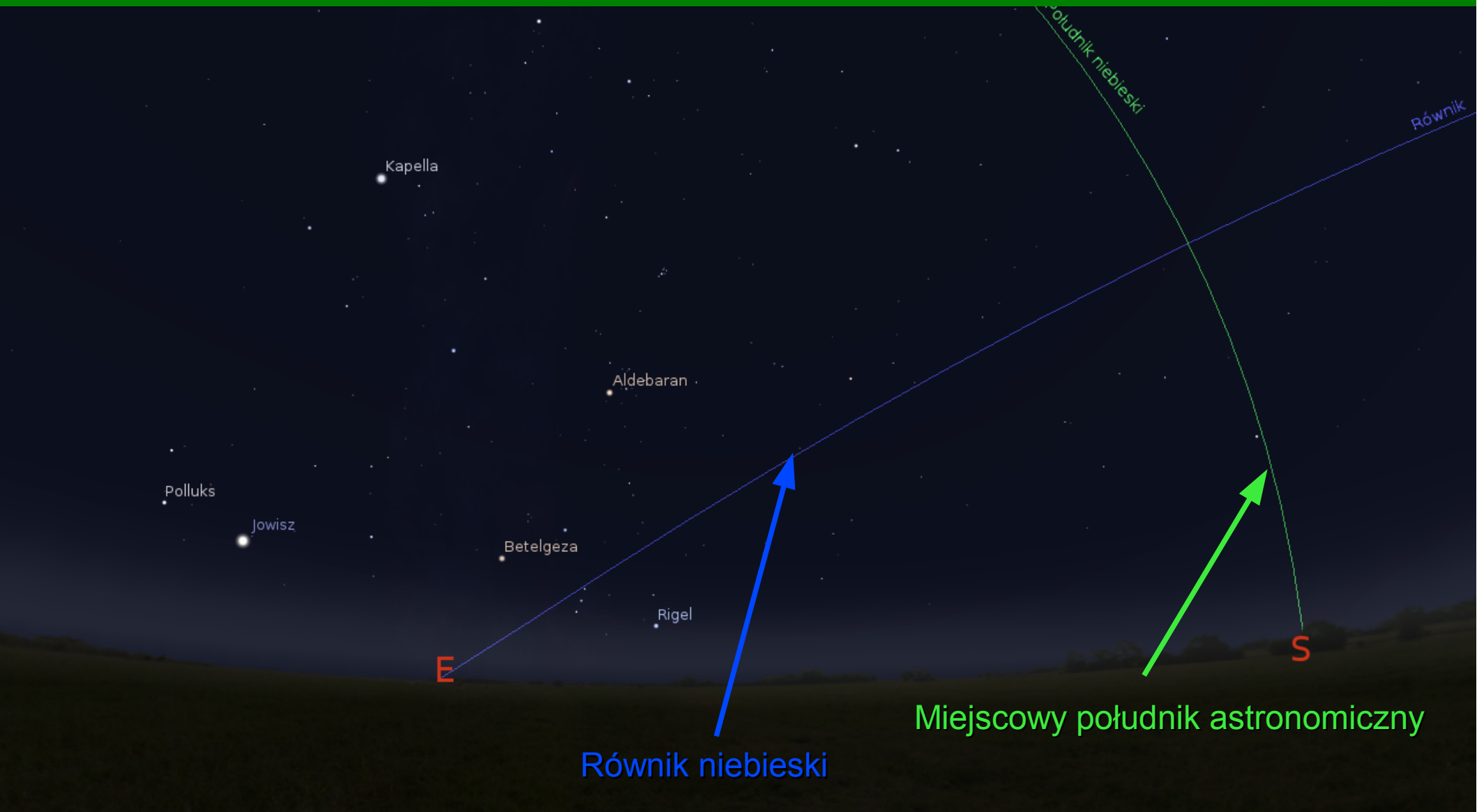


15 października 2013, 24:00



Miejskowy południk astronomiczny

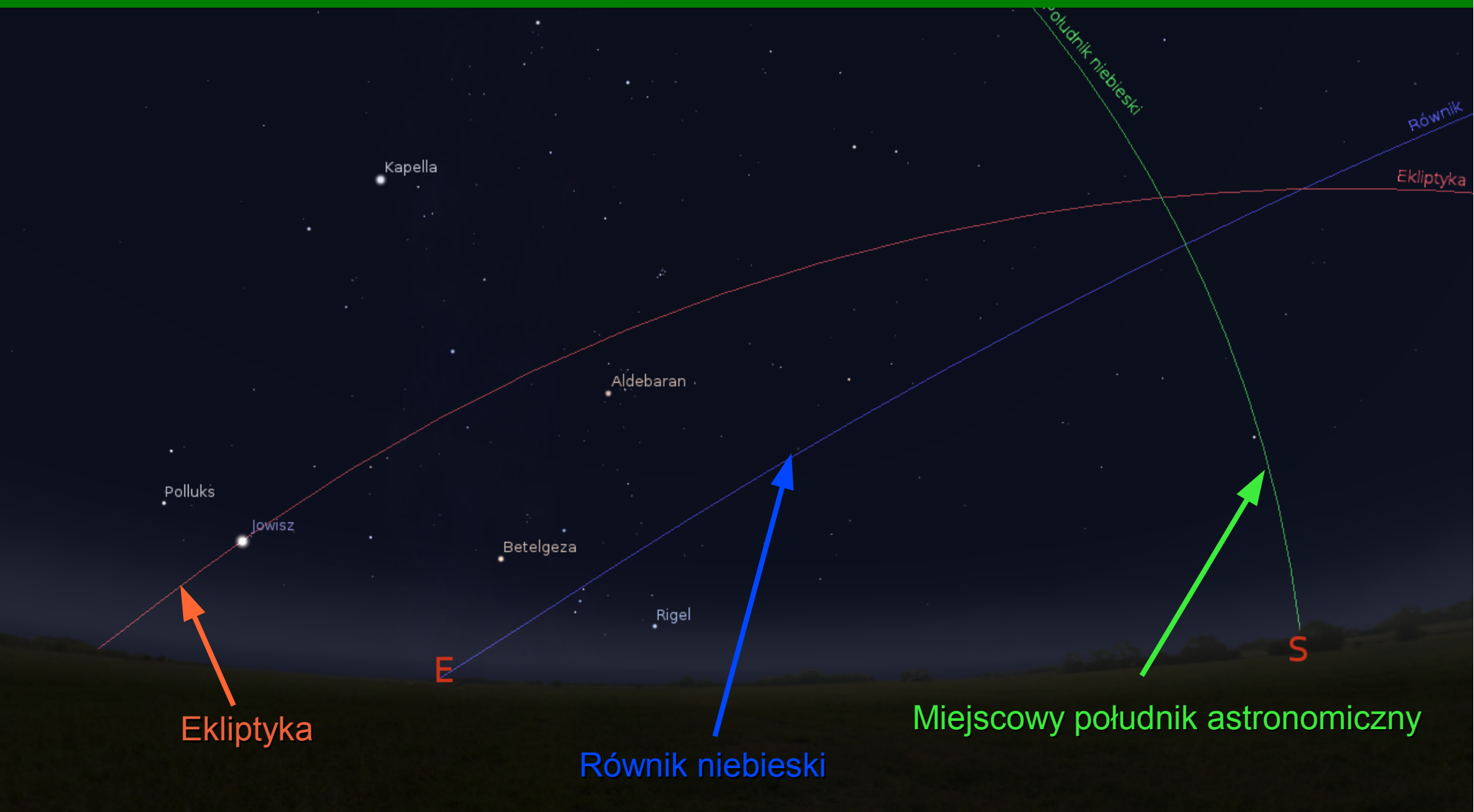
15 października 2013, 24:00



Równik niebieski

Miejsowy południk astronomiczny

15 października 2013, 24:00



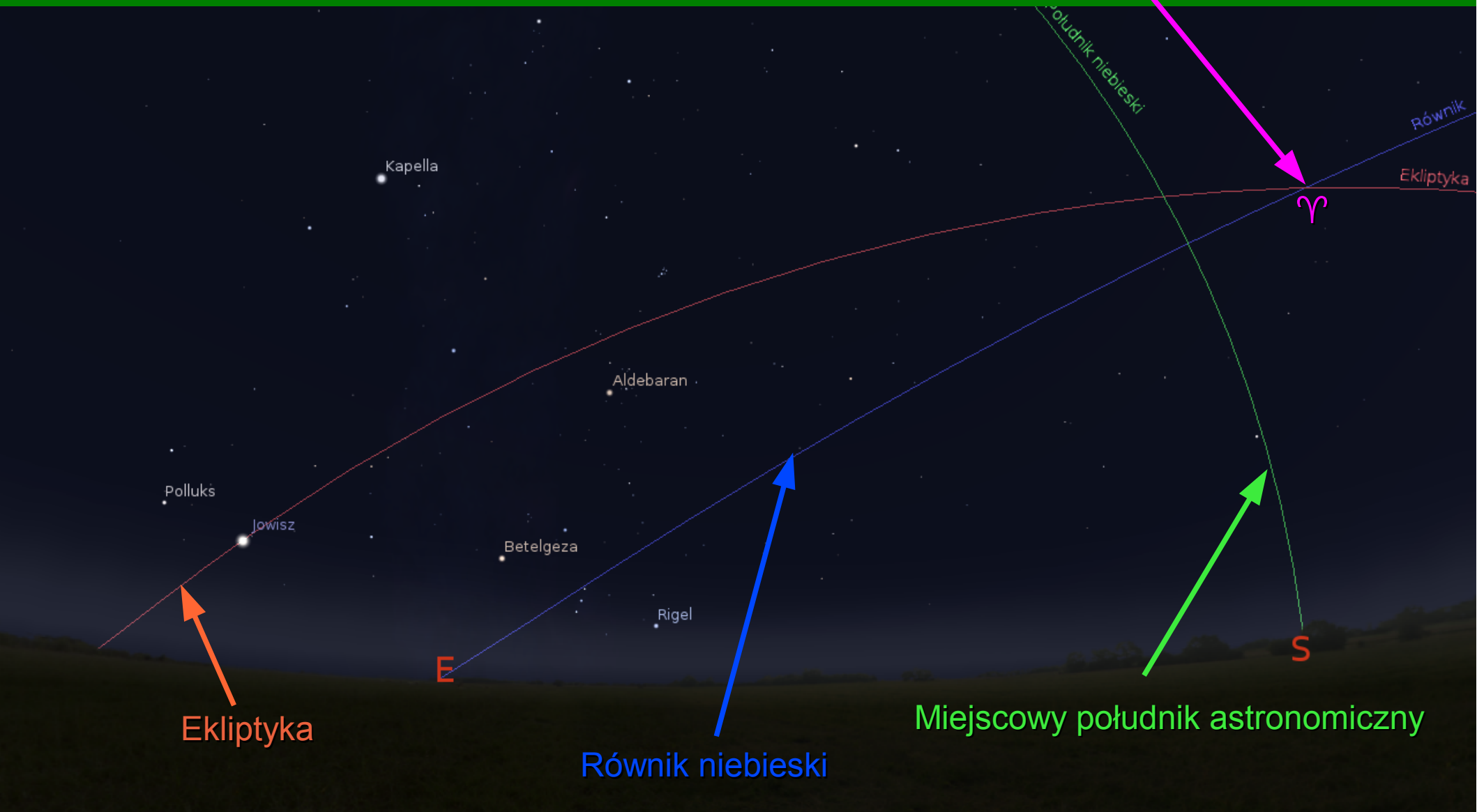
Ekliptyka

Równik niebieski

Miejscowy południk astronomiczny

15 października 2013, 24:00

Punkt Barana



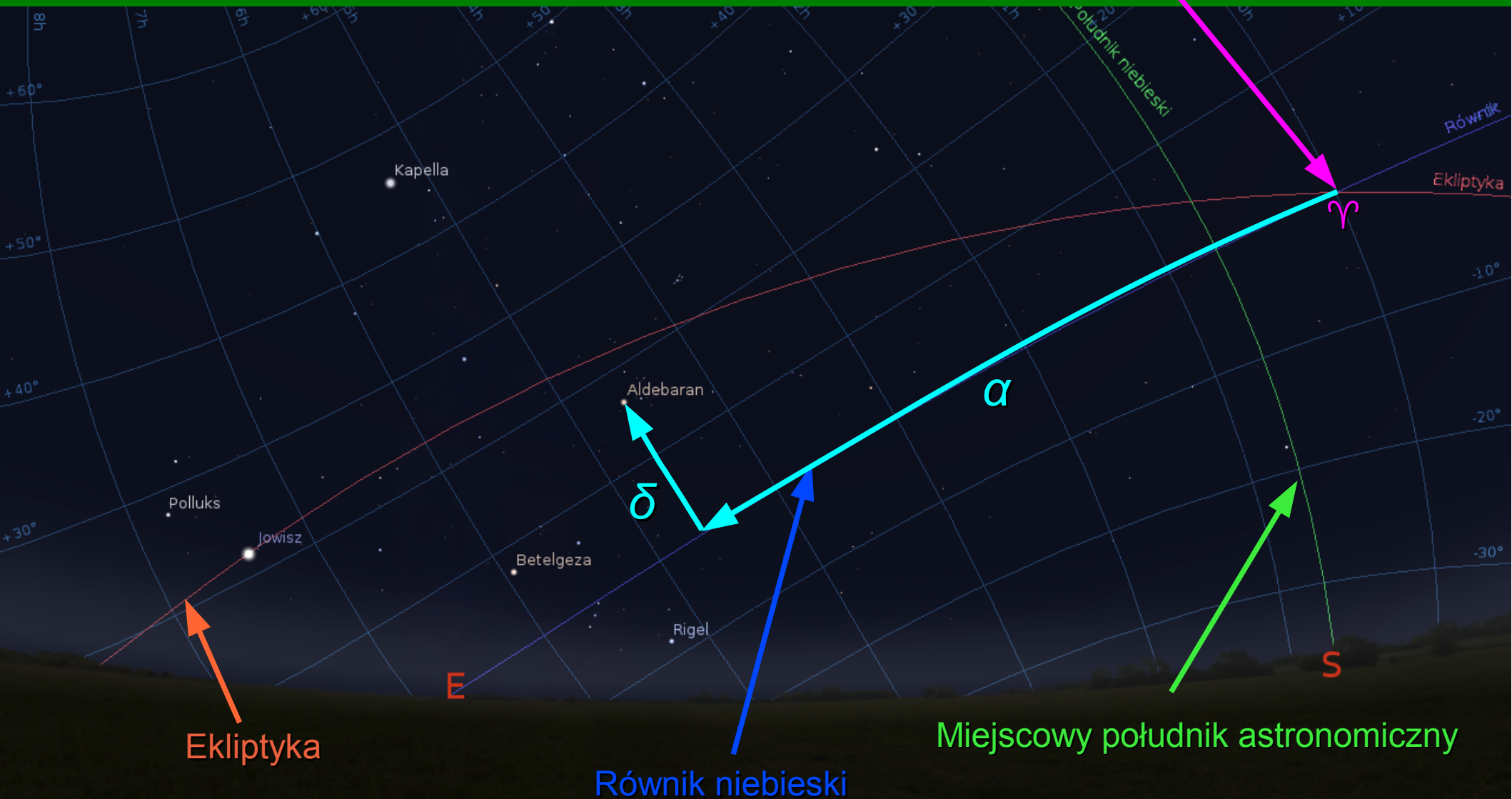
Ekliptyka

Równik niebieski

Miejscowy południk astronomiczny

15 października 2013, 24:00

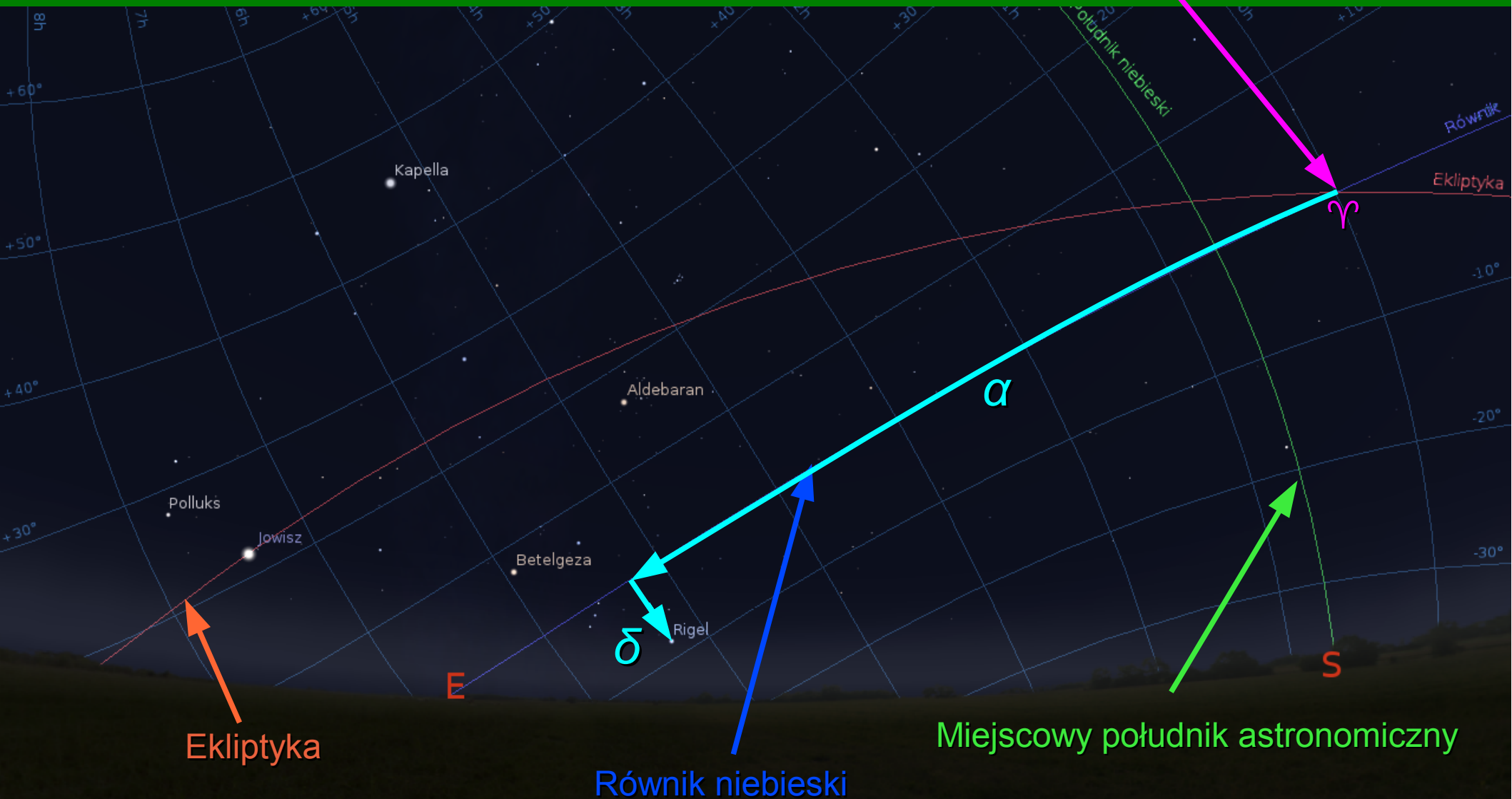
Punkt Barana



Aldebaran (α Tau) : deklinacja $\delta = +16^{\circ}32'09''$, rektascensja $\alpha = 4^{\text{h}}36^{\text{m}}43^{\text{s}}$

15 października 2013, 24:00

Punkt Barana



Rigel (β Ori) : deklinacja $\delta = -8^{\circ}11'12''$, rektascensja $\alpha = 5^{\text{h}}15^{\text{m}}12^{\text{s}}$

15 października 2013, 24:00

Punkt Barana



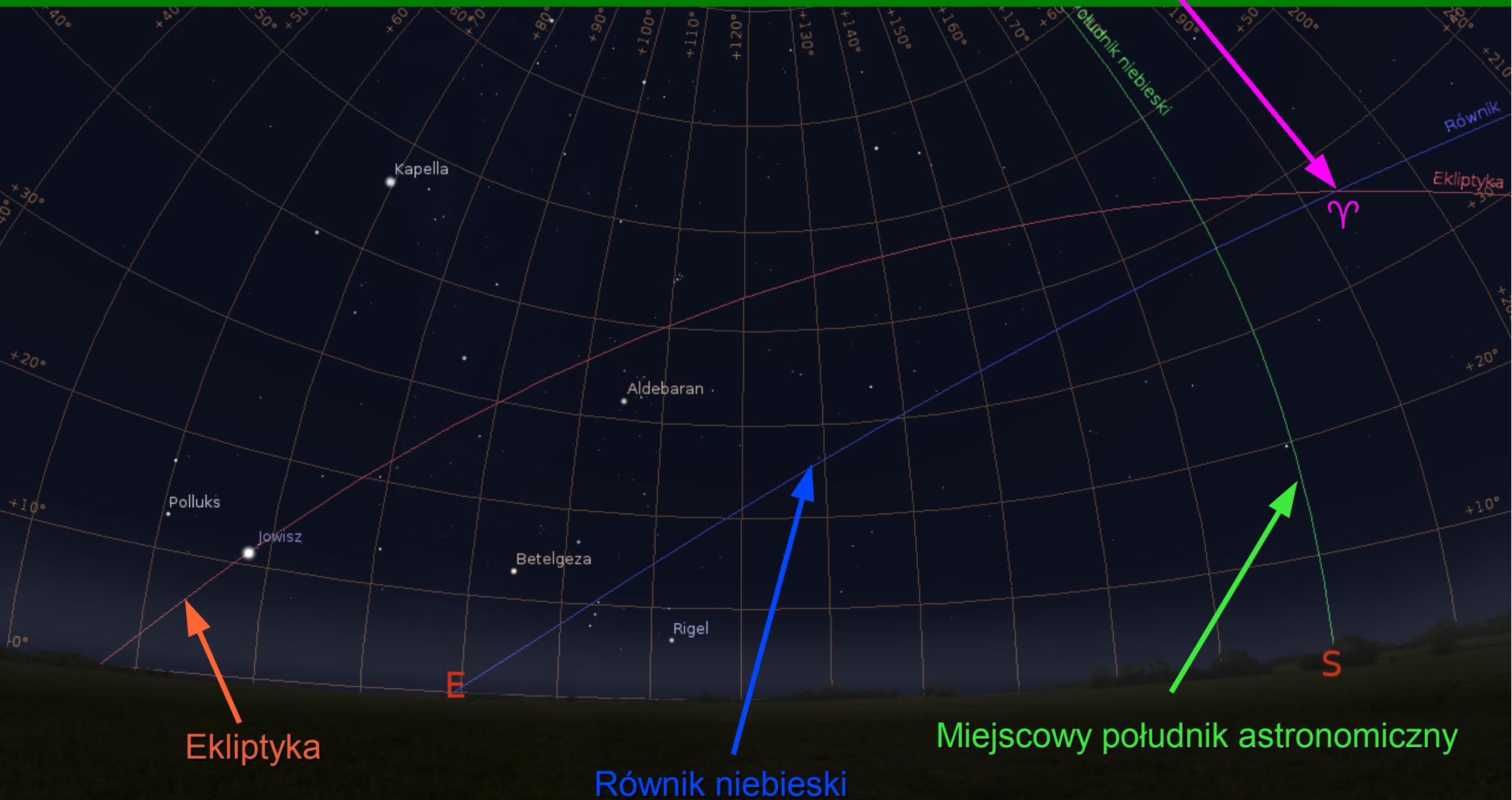
Ekliptyka

Równik niebieski

Miejscowy południk astronomiczny

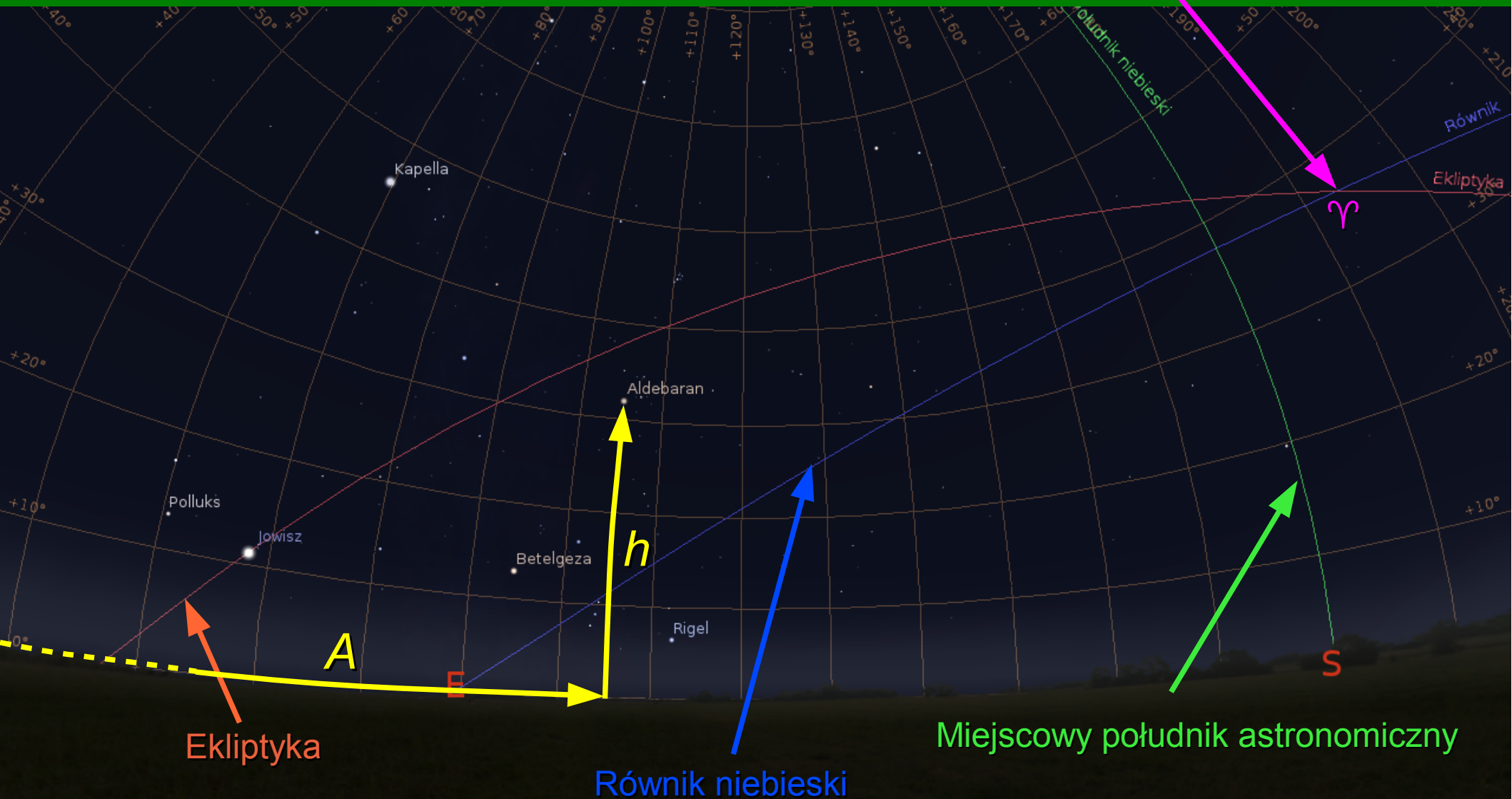
15 października 2013, 24:00

Punkt Barana



15 października 2013, 24:00

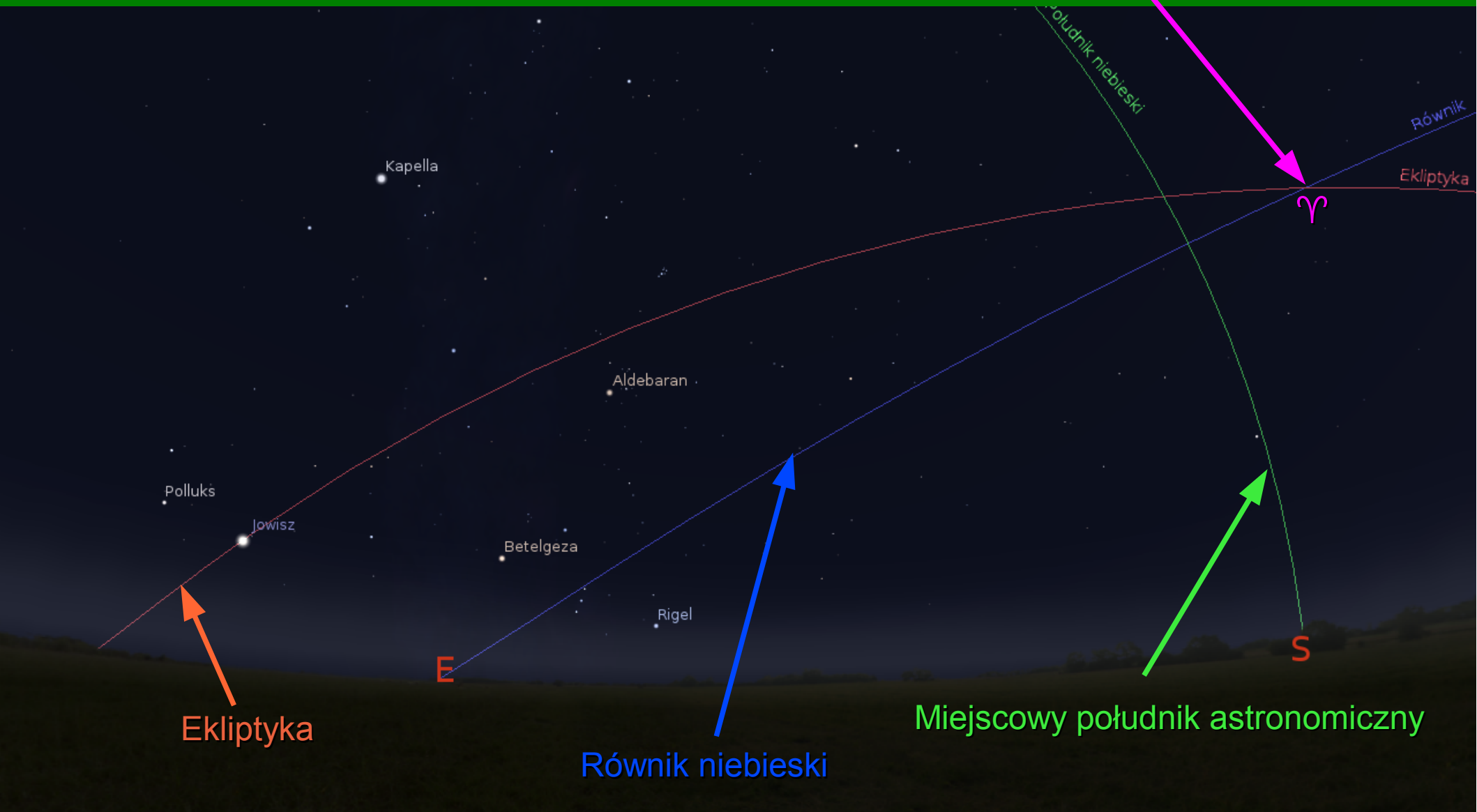
Punkt Barana



Aldebaran: wysokość $h = +32^{\circ}34'48''$, azymut $A = 106^{\circ}00'16''$

15 października 2013, 24:00

Punkt Barana



Ekliptyka

Równik niebieski

Miejscowy południk astronomiczny