SUPPLEMENT 2. ESTIMATING THE EPOCHS OF THE GCC AND GA

S2.1. SOLAR SYSTEM AND GALACTIC PARAMETERS

Coordinate Systems. In the Equatorial and Ecliptical coordinate systems [4] the same Origin of longitudes is used which coincides with the Vernal point ♈, or 0°♈. Due to the precession of the Equinoxes this point moves along the circle of Ecliptic at a speed of approximately

$$v_P \approx \frac{360°}{26000\,yr} = \frac{360 \times 60 \times 60'}{26000\,yr} \approx 50 \text{ sec of arc a year}. \tag{S2.1}$$

That is why these coordinates of the remote Celestial objects change significantly in time. At this, as the proper velocities of stars are much lesser than v_P, at a short time span they retain their Ecliptical latitudes with an insignificant error, though their longitudes (due to precession) grow, in average, at a speed v_P.

For this reason the epoch must be provided for any coordinate for specifying the moment of time for which the position of the object is given. As a rule, the coordinates of the basic objects are defined in the Equatorial system for the standard epoch of J2000.0 (formerly – for J1950). Thus in order to *obtain the Equatorial coordinates* for the specified moment we interpolate them with the use of the coordinates at the standard epochs. In order to obtain the *Ecliptic coordinates* of an object, we transform its standard Equatorial coordinates to the desired epoch and, then, convert them into Ecliptic ones with taking account of variation in the *Obliquity.* Here, we consider average coordinates, without correction for nutation.

Obliquity. For this quantity, a linear interpolation is used with the following reference values [11]

$$\varepsilon\,(\text{J1950}) = 23.4457889°, \text{ or } 23°\,26'\,44.840''; \tag{S2.2}$$

$$\varepsilon\,(\text{J2000}) = 23.4392911°, \text{ or } 23°\,26'\,21.448''. \tag{S2.3}$$

Note S2.1. Making use of this high-precision interpolation instead of the average values has shifted the point estimate of the epoch of the Great Celestial Conjunction by a year – from March 1999 to May 1998 (S2.7). This clearly illustrates a significant instability of the problem of estimating the "exact" date for the slow motions which are influenced by a series of perturbations.

Resume S2.1. From a viewpoint of long-termed historical predictions this instability leaves us the least hope for the coincidence of the predicted and actual epochs, even if the prediction was true in its essence.

Point Estimates of the Galactic Parameters. The Solar System revolves around the Galactic Centre (GC) almost exactly within the Galactic plane (Fig. 5): the Sun is only *10* pc *(up to 34 pc,* relative to other estimates*)* distant from this plane, though it is *10 000* pc (*5 000* pc) distant from the GC (Conventional bound of the Galaxy, resp.). Hence, the angle γ, the Sun makes to the Galactic Plane relative to the GC, fits the equation $tg\,(\gamma) = 10\,(pc)/\,10\,000\,(pc) = 0.001$, viz. it makes approximately $3'$ arc (viz. up to 11').

As far as the **Nucleus** is hidden with nebulae, the spatial star density decreases continually, and there exists no sharp bound in distribution of stars, the exact dimension of the Galaxy could not be defined, neither the true coordinates of the North Pole of the Galaxy and **GC.**

Due to this uncertainty in the Galactic parameters and Obliquity *we must remember that the accepted point estimates for these values* (Tables S2.1 – S2.3) *specify them, but with some error*. In this sense we cannot rely upon the *point estimate*, but if it is supplemented with an *interval estimate* that allows for this uncertainty, we can make our conclusions much more adequate. Besides, as far as *every process develops during some period of time*, the interval estimates allow us *to evaluate the duration of the process***.**

Resume S2.2. By allowing for the degree of uncertainty of the considered parameters in the interval estimates we may neglect both the angular discrepancy between the **GC** and **Galactic Plane**, and the error in the coordinate of the Galactic North Pole and take the **Galactic Plane** for the ***Solar System's Ecliptic*** $\mathbf{E_S}$.

The North Pole of the Galactic Plane (Galaxy) NP_G. In 1958, because of increased precision in determining the location of the Galactic Centre, the IAU defined the Equatorial coordinates of the North Pole of the Galactic Plane NP_G as specified in (S2.4), Table S2.1 (The reference values are given in blue).

Table S2.1. Coordinates of the North Pole of the Galactic Plane, NP_G

Epoch	Equatorial Coordinates						Ecliptical Coordinates						
	R.A., α			Declination, δ			Ecliptic longitude, λ			Ecliptic latitude, β			
	hr	min	sec	°	'	"	°	'	"	°	'	"	
J 1950	12	49	0	27	24	0	179	19	15.41	29	48	43.03	(S2.4)
GCC_P	12	51	21.45	27	8	14.30	179	59	60.00	29	48	41.57	(S2.5)
J 2000	12	51	26.28	27	7	42.01	180	1	23.52	29	48	41.50	(S2.6)

With the use of NP_G we can calculate the epoch of the **GCC** as the event when the Ecliptic longitude of NP_G reaches the Autumn Equinox λ=180° 0' 0", or 0° ♎. The point estimate for this epoch (S2.5) makes

$$GCC_P = \text{J1998.3475}, \quad \text{or} \quad \text{May 7, 1998} \qquad \text{(S2.7)}$$

At this epoch all cardinal points of the SZ coincide with those of the TZ (See Figs. 6, 7).

The Galactic Centre (GC). Numerically, its position is accepted to be specified by the powerful source of radio frequency and infrared radiation *Sgr-A* which many astronomers believe may coincide with a supermassive black hole at the center of our Galaxy [http://en.wikipedia.org/wiki/Galactic_center]. The **GC** coordinates for the epochs of interest are given in Table S2.2.

Table S2.2. Coordinates of the Galactic Centre, GC

Epoch	Equatorial Coordinates						Ecliptical Coordinates						
	R.A., α			Declination, δ			Ecliptic longitude, λ			Ecliptic latitude, β			
	hr	min	sec	°	'	"	°	'	"	°	'	"	
J 1950	17	42	24	- 28	55	0	266	7	53.00	- 5	32	10.43	(S2.8)
GCC_P	17	45	33.74	-29	0	26.03	266	49	43.13	- 5	36	26.82	(S2.9)
J 2000	17	45	40.04	- 29	0	28.1	266	51	6.22	- 5	36	27.59	(S2.10)

The Solar apex. The general direction of the solar apex is southwest of the star Vega near the constellation of Hercules. There are several coordinates for the solar apex. The initial IAU definition of the Solar Apex and its position at the moment of GCC are specified in (S2.11), (S2.12). The radioastronomical position for the reference epoch [http://en.wikipedia.org/wiki/Solar_apex] and for the epoch of GCC are given in (S2.14), (S2.13), respectively.

Table S2.3. Coordinates of the Solar Apex, SA

Epoch	Equatorial Coordinates						Ecliptical Coordinates						
	R.A., α			Declination, δ			Ecliptic longitude, λ			Ecliptic latitude, β			
	hr	min	sec	°	'	"	°	'	"	°	'	"	
J 1950	18	0	0	30	0	0	270	0	0	53	26	44.84	(S2.11)
GCC_P	18	1	51.33	30	0	0	270	40	27.80	53	26	18.31	(S2.12)
GCC_P	18	3	46.39	30	0	16.25	271	22	17.24	53	26	22.30	(S2.13)
J 2000	18	3	50.2	30	0	16.8	271	23	40.20	53	26	21.52	(S2.14)

For the **epoch** of the **GCC** the GC and NP longitudinal deviations from the TZ's Winter Solstice make

For **Galactic Centre**: $\Delta_{GC} = 270° - 266.829° \approx 3°$ (S2.15)

For **Solar Apex** (S2.12): $\Delta_{Apex} = 270.674° - 270° \approx 0.7°$ (S2.16)

For **Solar Apex** (S2.13): $\Delta_{Apex} = 271.371° - 270° \approx 1.4°$. (S2.16')

S2.2. INTERVAL ESTIMATES FOR THE GALACTIC ALIGNMENT

Interval of uncertainty. The considered uncertainty in the position of the North Pole of the Galactic Plane, $\mathbf{NP_G}$, is estimated by some astronomers by a value of up to a tenth of a degree. With respect to the precession (S2.1) this angular error of 6' corresponds to uncertainty in ± 7.2 yr; this yields the following interval estimate for the epoch of GCC

$$\mathbf{GCC^*} \approx \mathbf{J1998.3} \pm \mathbf{7.2}\ \text{yr} \approx \{\mathbf{1991.1, 2005.5}\}. \tag{S2.17}$$

But this estimate does not reflect the physical and esoterical significance of the Sun in this process of transferring (or amplifying) of the outer energies to within the Solar System. Thus in astrology only those extra-Solar-System objects are considered effectual which conjunct the Sun and cardinal points of the chart; planets are less significant in this sense.

Precession over the Solar disk. An efficient approach for obtaining an interval estimate for a similar event – **Galactic Alignment** (**GA**) – was proposed in [8]. It consists in estimating the *precession of the Galactic Equator over the Winter Solstice Solar disc*. In essence, a general validity of this approach rests on the same grounds that were put forward relative to the concept of the Solar Zodiac [1, Part 8].

The Solstice Sun is the moment when the Sun coincides with the Winter Solstice cardinal point 0°♑ (**WS**); this event takes place when the Sun's coordinate makes exactly λ=180° 0' 0" in Ecliptic longitude, or α=18h 0m 0s (viz. 180° 0' 0") in R.A. But *this relates to the center of the Sun*; the visible angular diameter of the Sun makes a significant value of 31' 31.34" (at aphelion) to 32' 35.78" (at perihelion, near the Winter Solstice).

Let σ_S be half a diameter of the Solar disc. Then the Sun starts to cover the WS after its centre approaches the place being σ_S distant from this cardinal point (Fig. S2.1.a) until the transiting Sun's centre becomes σ_S distant from the WS. By interpolating the above Sun's diameters for the Solstice (as it is about two weeks distant from the aphelion) we get

$$\sigma_S = (32'\ 30.84")/2 = 16'\ 15.42". \tag{S2.18}$$

Interval estimate for the GA. The Galactic Equator intersects the Solstice Sun disk after getting in touch with it (Fig. S2.1.b); after then, the point **VE** (the "Vernal Equinox" of the Solar Zodiac – the intersection of the Ecliptic and Galactic Equator) continues to precess towards the WS until the Great Celestial Conjunction, and further on – till the point **C'**.

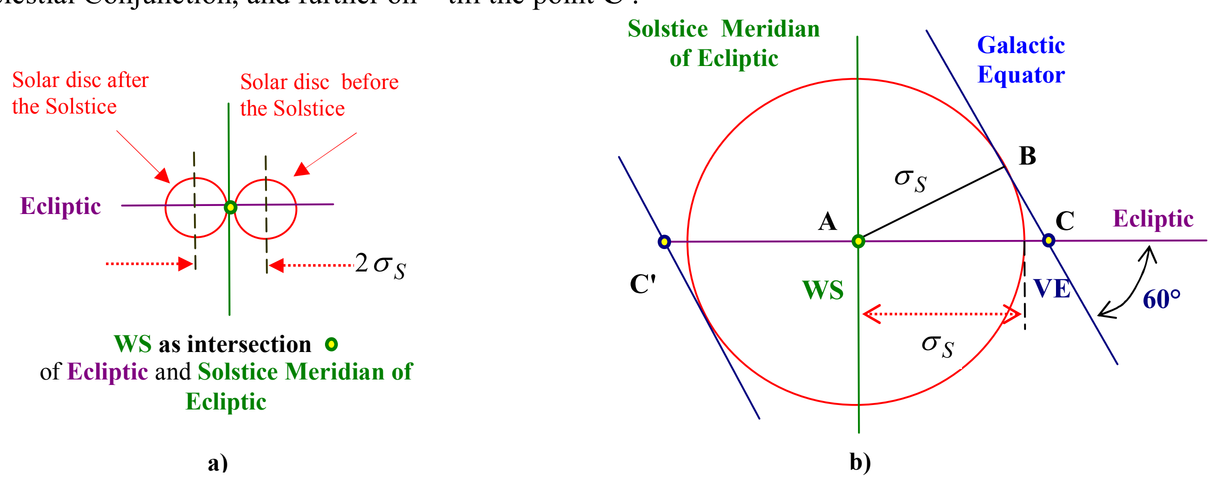

Fig S2.1. Obtaining an interval estimate for the GA

As far as the Galactic Equator is inclined to the Ecliptic at an angle $\angle$**BCA** which makes approximately 60°, the length of the segment **CA** makes σ_S/sin (60°). Hence, the cardinal point **VE** precesses this distance over the period of

$$\mathbf{T_{GA}} = \frac{\sigma_S}{sin(60°)\cdot v_P} = \frac{16'\,15.42''}{0.866\cdot 50''} \approx \mathbf{22.5}\text{ (yr)}. \qquad \text{(S2.19)}$$

But this value should not be simply substituted in (S2.17) instead of 7.2 years!

With respect to the definition (4), the *Galactic Alignment* is a *discrete event that allows just for the Winter Solstice*. Hence, both for this event itself, and for its interval bounds we should consider *the Solstices*. Therefore,

- for the ***point estimate*** of the **Galactic Alignment** we must take neither the year 1998 [8], nor the WS of 1998, but the Winter Solstice being the closest to the epoch (S2.7), that is

$$\mathbf{GA_P} = \{\,\textbf{December 21, 1997; GMT 20:07}\}; \qquad \text{(S2.20)}$$

- for the ***interval estimate*** of the **Galactic Alignment** (viz. the Galactic Alignment "zone", or "era-2012.") we therefore must use neither the interval 1998 +/- 18 years (viz. 1980 – 2016) [8], nor the year of 1998, but those *Winter Solstices* which fit the interval $\mathbf{GCC_P}$ +/- **22.5** years, that is

$$\mathbf{GA_I} = \{\,(\,\textbf{Dec. 22, 1975; GMT 11:46}\,)\,,\,(\,\textbf{Dec. 22, 2019; GMT 4:21}\,)\,\}. \qquad \text{(S2.21)}$$

Hence, the relations (S2.20), (S2.21) define the corrected, with respect to the definition of the GA, point and interval estimates (6) for the Galactic Alignment.

S2.3.INTERVAL ESTIMATES FOR THE EPOCH OF THE GREAT CELESTIAL CONJUNCTION

Meanwhile, with respect to the Great Celestial Conjunction the idea of precession of the Galactic Equator over the Solar disc deserves further analysis, but under the following natural conditions.

C1. As far as we are concerned with the Celestial events on the ***Ecliptic, an adequate model must deal with the points on it*** as well. The most important elements of the SZ are presented on the Ecliptic by its cardinal points; at this, the Ecliptic longitude of any SZ's cardinal point (e.g. **VE)** defines the positions of the remaining ones to within a summand of $k\times 90°$ (k=1, 2, 3).

C2. By considering the ***Solar disc as a lens that focuses the Solar and Galactic energies*** being emanated from the adjacent cardinal points of TZ and SZ into the unitary Earth-directed flow at the Winter Solstice, we can apply the same approach to the opposite Solstice, as well as to the TZ's Equinoxes for the similar situations in which the transiting Sun covers the respective pairs of the cardinal points of the Tropical and Solar Zodiacs.

C3. As far as we are ***allowing for the diameter of the transiting Sun***, and the consideration of the cardinal points of both Zodiacs does not require us to give dominance to one of them, we are not generally conditioned to an analysis of the exact conjunction of the centre of the transiting Sun with a cardinal point of TZ. Meanwhile, taking into account of the visible Solar diameter allows us to evaluate the efficacy of these conjunctions like a significance of a total Solar eclipse may be estimated by a duration of black-out.

Basic precessional period. Find firstly an interval estimates for the epoch (S2.7) with respect to condition **C1** provided that the Solar disk centre is exactly at a cardinal point of TZ. As far as the precession of the point **VE** over the Solstice Solar disk starts with the position in which it firstly gets in touch with the disc (Fig. S2.2), it reaches the TZ's Cardinal Point **WS** in the ***basic precessional period***

$$\mathbf{T_S} = \frac{\sigma_S}{v_P} = \frac{16'\,15.42''}{50''} \approx 19.508 \cong \mathbf{19.5}\ (\delta = 0.04\%)\text{ years}. \qquad \text{(S2.22)}$$

Note S2.2. Within an insignificant error of 0.04% it equals to $\mathbf{N_P} = \mathbf{19.5}$.

Era of GCC. Though the "exact" GCC has occured in 1998, its actual influence is to be distributed over the preceding and subsequent 19.5-year time intervals; this gives the estimate of the ***Era of GCC***

$$\mathbf{GCC_{19.5} = GCC_P \pm T_S = J1998.3 \pm 19.5 = \{\,1978.8\,,\,2017.8\,\}.} \qquad \text{(S2.23)}$$

Note S2.3. As the estimate (S2.17) allows just for an uncertainty in the Galactic North Pole coordinate, so the estimate (S2. 23) takes into account the physical peculiarities of the Solar disc "lens" (viz. **C2**).

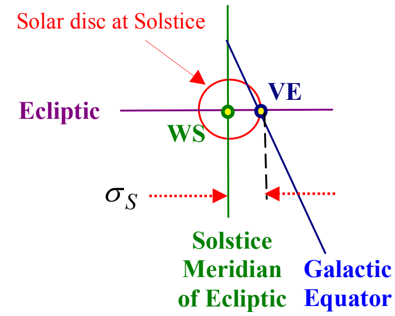

Fig. S2.2. The precessional SZ's Cardinal point VE firstly touches the Winter Solstice Solar disc

Note S2.4. In particular, if the definition of the GA is corrected so that the **VE** point is taken instead of the tangent BC, for the GA the interval estimate (S2. 21) may thus be improved as follows

$$\mathbf{GA_S} = \{\ (\mathbf{Dec.\ 22,\ 1978}),\quad (\mathbf{Dec.\ 21,\ 2016})\ \}. \tag{S2.24}$$

Age of GCC Transformations. Find now an interval estimates for the epoch (S2.7) with respect to **C3.** The Solar disc starts to cover the cardinal points **VE** of SZ and **WS** of TZ concurrently after the former approaches the latter at a distance of $2\sigma_S$ (Fig. S2.3). This means that each year fitting the time interval

$$\mathbf{GCC_{39}} = \mathbf{GCC_P} \pm 2\times \mathbf{T_S} = \mathbf{J1998.3} \pm 2\times \mathbf{19.5} = \{\ \mathbf{1959.3}\ ,\ \mathbf{2037.3}\ \} \tag{S2.25}$$

the Solar disk covers the respective pairs of the TZ and SZ cardinal points simultaneously. This interval is the largest one where the Solar disc covering the cardinal points of both Zodiacs still works as a concentrator of the Space and Solar influence; for this reason call it the ***Age of GCC Transformations.***

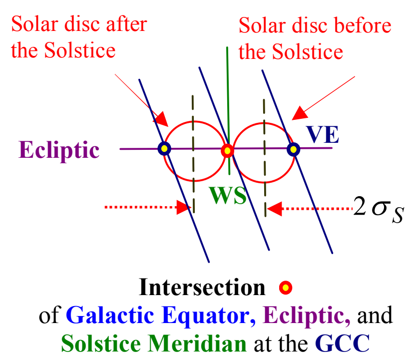

Fig. S2.3. The extremal and central precessional positions of the Galactic Equator and VE point of the SZ before and during the Great Celestial Conjunction

Note S2.5. The iterative covering of the pairs of cardinal points of the Tropical and Solar Zodiacs (e.g. **WS** and **VE**) by the Solar disc as specified in **C2** can be likened to the actual situation with a solar eclipse: although this is the unique astronomical moment when the Sun, Moon, and Earth centres come to the "exact" alignment, the Eclipse spot moves over the surface of Earth for hours. The difference is that the Solar disc "lens" works as a "force-pump": the Sun covers these pairs of cardinal points four times a year, and each time with an increased duration until the "exact" epoch of the GCC (May 7, 1998) when the **Galactic Equator, Ecliptic,** and **Solstice Meridian of Ecliptic** intersect at the cardinal points 0° ♑ and 0° ♋ (central position of the Galactic Equator in Fig. S2.3). **39** years before the GCC, the transiting Sun starts to cover both cardinal points, ○ (0° ♑) of the TZ and ○ (the "vernal" Equinox of the SZ), concurrently (right position of the Galactic Equator in Fig. S2.3); **39** years after the GCC, the transiting Sun stops to cover both these cardinal points concurrently (left position of the Galactic Equator in Fig. S2.3). The same holds true for the remaining pairs of the cardinal points (Fig. S2.4).

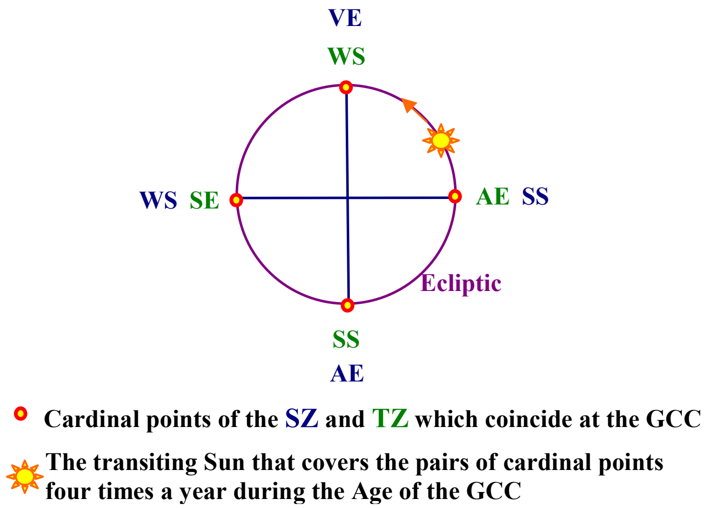

Fig. S2.4. Conjunction of TZ's and SZ's cardinal points at the "exact" moment (S2.7) of the GCC
(For correlation, See Fig. 7)
SE – Spring Equinox; **AE** – Autumn Equinox; **WS** – Winter Solstice; **SS** – Summer Solstice

Reiteration of the GCCs. Due to the orthogonality of the zodiac axes ***the Age of GCC Transformations*** repeats ***four times a Platonic year***, but each time the correspondence between the cardinal points of the TZ and SZ changes with respect to Fig. 7: next time (viz. in 6500 years) the Spring Equinox and Autumn Equinox of the TZ will coincide with the same Equinoxes of the SZ, whereas the TZ's Winter Solstice – with the SZ's Summer Solstice, and vice versa.

Note S2.5. The dominance of the TZ's **WS** point over the Summer Solstice might be explained by the closeness of the Galactic Centre and Solar Apex. Meanwhile, alignment of all these four points along the Solstice line may probably show its dominance over the Equinox axis. On the other hand, the axis of Equinoxes is aligned with the Axis of the Galaxy. So, we may conclude that ***at the current GCC*** (when the **VE** of the SZ coincides with the **WS** of the TZ) the TZ's **WS** is the most significant one, whereas the actuality of the remaining TZ's cardinal points, in a decreasing order, is as follows: SS, and Equinoxes.

The interval of culmination of the GCC. At the Winter (Summer) Solstice the Sun moves along the Ecliptic approximately at a speed of 61' (57') a day. Then, at every Winter (Summer) Solstice the Solar disc covers the point 0°♑ (0°♋) for a period of

$$t_W = \frac{2\sigma_S}{61} \times 24\ h = \frac{32.514}{61} \times 24h \approx 12.79\ hours\ ,$$

$$t_S = \frac{31'31.34''}{57'} \times 24\ h = \frac{31.526}{57} \times 24h \approx 13.27\ hours\ ,$$

or

$$\mathbf{T_{SG} = 13}\ \text{(hours)} \qquad \text{(S2.26)}$$

in average, with an insignificant error of 0.2%. The **VE** of the SZ is also covered every year by the Solar disc during the same average period, but 39 years before (or after) the "exact" moment of the GCC (the extreme positions ⚬ of the Galactic Equator in Fig. S2.3) these two events start to take place concurrently, but for an instant. Year by year, while the point **VE** approaches the **WS**, the period of concurrent covering of these two points by the Sun grows till the value of t_W (the central position ⚬ of the Galactic Equator in Fig. S2.3); after then, the process develops in the inverse order. The same process develops with other pairs of cardinal points (e.g. **SS** and **AE)**. Note that this process may also be likened to the development of the Solar eclipse: the closer we get to the epoch of the "exact" correlation, the longer the Sun accepts the Galactic influence through the VE point of the Solar System Zodiac and retransmits it, together with its own Solstice effect, further on – to the Earth, through the cardinal point **WS** of the TZ. For this reason the Solstices may have especial influence for the Terrestrial life at present.