Same Sky, Different Chart: How Orb Conventions Change the Aspect List, and What a Continuous Model of Aspect Strength Does and Does Not Repair

Vít Hnilica
Twelvera, Czech Republic
vit.hnilica@twelvera.com
ORCID: 0009-0000-9993-9648

Preprint · Version 1.0 · November 2026 · DOI: 10.5281/zenodo.24635142

Astrologers and astrological researchers do not agree on how wide the orb of an aspect should be, and published studies use many conventions. We measured how much the list of major aspects in a chart depends on that choice. For 20,000 synthetic births between 1900 and 2100 we compared nine conventions: moiety orbs in the tradition of Lilly, extended to the outer planets and the chart angles, five uniform orbs, two orbs that depend on the aspect, and the recommendation of the Faculty of Astrological Studies as reported in the literature. Moiety orbs and a uniform orb of 8° gave almost the same mean number of aspects per chart (15.7 and 15.8), yet the two lists had a mean Jaccard agreement of 0.74 and were identical in 0.9% of charts. The tightest aspect of the chart was the same in 82% of charts. A continuous strength that falls smoothly to zero at the orb did not improve agreement between these two conventions (weighted Jaccard 0.73 against 0.74), although the rank order of the aspects agreed better (rank correlation 0.86 against 0.77) and the strength of a chart's transits became continuous in time, where the binary count changed in about 2,600 hourly intervals per chart in a year. A kernel of fixed width raised the agreement between the same two conventions to 0.93–1.00, largely by construction, and brought the jumps back wherever a narrower orb cut it off above zero. Two uniform orbs that differ by 1° gave the same list in about one chart in seven. We recommend that studies state the orb for every pair and report results under at least two conventions. The study concerns what software computes and does not test the validity of astrology.

Keywords: astrology; aspects; orb; chart interpretation; agreement; Jaccard index; kernel; transits; research methods

1 Introduction

An aspect is an angle between two points of a chart that is close to one of a small set of exact angles. How close it has to be is the orb. A conjunction between the Sun and Mars with a separation of 7° is an aspect for an astrologer who allows 8° and is not one for an astrologer who allows 6°. The first reads a Sun–Mars conjunction into the chart and the second does not, from the same sky.

There is no single rule. Lilly (1647) gave each planet its own orb and counted an aspect when the separation was within half the sum of the two orbs, the moieties, so that the tolerance depends on which bodies are involved. Much modern practice gives the orb to the aspect and not to the planet. The Faculty of Astrological Studies is reported to suggest 8° for the major aspects, 4° for the sextile and two further degrees when the Sun or the Moon is involved (Tompkins, 1989, as cited in Tarvainen, 2020). Software lets the user choose, and research papers differ: within one issue of this journal's field, one study used "standard" orbs of 10° for the conjunction and opposition, 8° for the trine and square and 6° for the sextile, tried narrower and wider sets and reported that the result changed with them (Godbout, 2020), and another estimated the "maximum working orb" from data and found 8° for most major aspects and about 5° for sextiles (Tarvainen, 2020).

That work asks which orb is right. The question here is different and does not depend on the answer: how much does the content of a chart change when only the orb convention changes? This matters for two reasons. For interpretation, a reading built from a list of aspects is a reading of that list, and two readings of the same birth can differ before any judgement is made. For research, a study that counts aspects reports a quantity that depends on a parameter which is often stated in one sentence or not at all, and a replication with different software may be counting something else. A companion study showed that the expected frequency of an aspect also depends on the orb and on the pair (Hnilica, 2026).

One response to the arbitrariness of a cut-off is to drop it and give each aspect a strength that falls with distance from exactness. This is common in software and has an obvious appeal: an aspect at 7.9° and one at 8.1° no longer fall on opposite sides of a line. This study quantifies how continuous strength models affect agreement between orb conventions. Our search (Google Scholar and the abstracts on the website of the journal *Correlation*, 28 November 2026) found the works cited above, which estimate or vary orbs, but no measurement of agreement between the aspect lists produced by different conventions; its scope is described in section 5.

We ask four questions. The hypotheses were written after a pilot on a different, smaller sample and were not preregistered.

1. How many aspects do two lists share when they differ only in the orb convention? H1: the mean Jaccard agreement between moiety orbs and a uniform 8° is below 0.8.
2. Is at least the tightest aspect of the chart stable? H2: the tightest aspect under moiety orbs and under a uniform orb is the same in fewer than 90% of charts.
3. Does a continuous model of strength improve agreement? H3a: a kernel scaled by the orb does not. H3b: a kernel of fixed width, where the orb only cuts off, improves weighted agreement by more than 0.1.
4. How do the binary and the continuous model behave in time? H4: the binary sum over a chart's transits jumps by whole units, and the continuous sum has no jumps.

2 Method

2.1 Sample

We drew 20,000 synthetic births. The instant was uniform between 1 January 1900 and 31 December 2100 (UTC, whole minutes). The place was one of the 200 largest populated places in the GeoNames gazetteer (GeoNames, n.d.), drawn with probability proportional to population, so that the chart angles reflect latitudes where people live (37.8° S to 59.9° N). The random seed was fixed. No data about real people were used.

For each birth we computed the apparent geocentric ecliptic longitude of date of the Sun, the Moon and the planets from Mercury to Pluto, and the Ascendant and Midheaven, with the chart engine of one commercial application (see Conflict of interest), which reads the JPL ephemeris DE442s, a short-span file of DE442, itself an update of DE440 (Park et al., 2021). Civil time was treated as UT1 for the whole period. The positions were recomputed for all 20,000 births with the Swiss Ephemeris (Koch & Treindl, n.d.). The bodies agreed to within 0.0043° (the Moon; 0.0011° or better for the others). The angles agreed with a median difference of 0.00006°, but for dates in the future differed by up to 1.41°, because the Swiss Ephemeris predicts the difference between UT1 and atomic time and the engine does not; an angle moves about 1° in four minutes. The recomputation reproduced the main agreement figures to four decimal places (section 3.1).

Results are given for two sets of pairs: the 45 pairs among the ten bodies, and 65 pairs that add the aspects of each body to the Ascendant and to the Midheaven. The pair Ascendant–Midheaven was left out.

2.2 Aspects and conventions

Only the five major aspects were used: conjunction (0°), sextile (60°), square (90°), trine (120°) and opposition (180°). For a pair with angular separation *a* on the shorter arc, the deviation *d* is the distance of *a* from the nearest of the five angles, and the pair has that aspect under a convention if *d* is not greater than the orb the convention gives to the pair and aspect. With the orbs used here the nearest aspect is always unique.

Nine conventions were compared.

- **L, moiety orbs.** The orb of a pair is the sum of the two moieties: Sun 8.5°, Moon 6.25°, Mercury 3.5°, Venus 4°, Mars 3.75°, Jupiter 6° and Saturn 5°, the halves of the orbs in Lilly (1647, p. 107). Uranus, Neptune and Pluto have 2.5° and the two angles 5°, and a pair that includes a body outside the traditional seven is capped at 6°. These last three rules are conventions of the engine, not of Lilly; under them every aspect to an angle has an orb of 6°.
- **F2, F4, F6, F8, F10, uniform orbs** of 2°, 4°, 6°, 8° and 10° for every pair and aspect.
- **AD, orb by aspect:** 8° for the conjunction and opposition, 7° for the square and trine, 5° for the sextile. **AD+L** adds 2° when the pair includes the Sun or the Moon. These two are illustrative and are not attributed to any school.
- **FAS:** 8° for the conjunction, square, trine and opposition, 4° for the sextile, and 2° more when the pair includes the Sun or the Moon, the recommendation of the Faculty of Astrological Studies (Tompkins, 1989, as cited in Tarvainen, 2020). This convention was added after the literature search and was not part of the original plan; no hypothesis concerns it.

In addition, uniform orbs from 1° to 12° in steps of 0.5° (23 values, 253 pairs of orbs) were compared with each other.

2.3 Agreement between lists

For a chart and two conventions A and B, the aspect lists are sets of pair-and-aspect items. Their agreement is the Jaccard index (Jaccard, 1912), the number of items in both lists divided by the number in either. When both lists are empty the index is set to 1 and the lists count as identical; this can happen only under the narrowest orbs (under the uniform 2°, 171 of the 20,000 charts had no aspect among the ten bodies). We report its mean over charts, the share of charts in which the two lists are identical, and the mean number of aspects. Intervals for means are 95% normal intervals over charts; intervals for proportions are Wilson intervals.

To see where disagreement arises, the pairs were grouped by the speed of the bodies (Sun, Moon, Mercury, Venus and Mars as fast, the others as slow), by whether an angle is involved, and by whether the pair includes the Sun or the Moon. Within a group we pooled the items over all charts.

2.4 The tightest aspects

Within a chart the aspects were ranked by relative tightness, the deviation divided by the orb, *d*/orb. With a uniform orb this is the ranking by *d* and does not depend on the width; with moiety orbs it depends on the pair. We report the share of charts in which the first-ranked aspect is the same under two conventions, and the mean overlap of the first three. A chart enters the first comparison only if both conventions give it at least one aspect, and the second only if both give at least three; with orbs of 4° or more this is every chart for the first comparison.

2.5 Models of strength

The binary model gives an aspect a strength of 1 inside the orb and 0 outside. Four models in which the strength depends on the distance from exactness were compared with it, each with a strength *s* between 0 and 1 that is a function of the deviation *d*. Only the first two reach zero at the orb and are continuous there. The Gaussian is al-

ways cut off above zero, and the kernel of fixed width is cut off above zero whenever the orb is narrower than its width.

- **kernel scaled by the orb:** $s = (1 - (d/\text{orb})^2)^2$ for $d \le$ orb. This is the biweight kernel used in kernel smoothing (Silverman, 1986). Both s and its first derivative are zero at the orb.
- **linear, scaled by the orb:** $s = 1 - d/\text{orb}$.
- **Gaussian, scaled by the orb:** $s = \exp(-d^2/2\sigma^2)$ with σ = orb/2, cut off at the orb, where it still has the value 0.135.
- **kernel of fixed width:** $s = (1 - (d/w)^2)^2$ for $d \le \min(\text{orb}, w)$, with w of 6°, 8° or 10° for every convention. The orb decides only where the strength is cut off. A Gaussian with a fixed σ of 3° cut off at the orb was a further control.

Agreement between two conventions under a model was measured by the weighted Jaccard index, the sum over pairs of the smaller of the two strengths divided by the sum of the larger, which reduces to the ordinary index for the binary model, and by Spearman's rank correlation between the two vectors of strengths over the pairs of a chart. If no pair has any strength under either convention the weighted index is set to 1, and the correlation is undefined for a chart in which one of the vectors is constant and such a chart would be left out of its mean; neither case occurred in the comparisons reported, in which every chart had at least one aspect under each convention.

2.6 Behaviour in time

For the first 50 births of the sample we computed the transits of the ten bodies to the ten natal bodies and the two natal angles (120 pairs) through the year 2027, at steps of 10 minutes, with the transit orb of the engine: 3°, and 2° for the sextile. The total strength of a chart at an instant, $S(t)$, is the sum of the strengths of its 120 pairs. We counted changes of S greater than 0.5 between neighbouring samples, at steps of one hour and of 10 minutes, and the largest change.

A threshold on the change depends on the step, so continuity was also tested by scaling: for a function with a bounded derivative the change between neighbouring samples is at most proportional to the step, so the largest change is expected to shrink by a factor of about 6 from one hour to 10 minutes, and by exactly 6 only where the function is close to linear over an hour. For a function with isolated jumps the largest sampled change does not shrink in this way: as the step tends to zero it approaches the largest jump. A count of changes is a count of intervals between neighbouring samples; an aspect that begins while another ends within one interval leaves the binary sum unchanged and is not counted.

The kernel scaled by the orb is continuous with a continuous first derivative as a function of d, including at the orb, and d is a continuous function of time wherever the longitudes are. $S(t)$ is therefore continuous by construction; the numerical test checks the implementation and the size of the changes, not the theorem.

We also examined stations. For each of the 17 stations of the transiting planets in 2027, each chart and each natal point, we looked at the pairs within orb at the instant of the station and separated those in which the deviation had a local minimum there: the transiting planet approached the exact aspect, stopped and withdrew.

3 Results

3.1 Agreement between aspect lists

The mean number of major aspects per chart ranged from 4.0 with a uniform 2° to 19.7 with a uniform 10° among the ten bodies (Table 1). Moiety orbs and the uniform 8° gave almost the same number, 15.7 and 15.8.

The same number of aspects does not mean the same aspects. The mean Jaccard agreement between moiety orbs and the uniform 8° was 0.742 (95% interval 0.741–0.744) among the ten bodies and 0.745 (0.744–0.746) with the angles, and the two lists were identical in 0.88% and 0.19% of charts (Table 2, Figure 1; all 36 pairs of conventions are in Supplementary Table S1). H1 is supported: both intervals lie below 0.8. On average a chart had about 16 aspects under each of these two conventions, of which about 13 or 14 were shared and four or five appeared under one convention only. The recomputation with the Swiss Ephemeris gave the same two indices, 0.7423 and 0.7449.

No pair of the conventions with realistic widths agreed fully. Moiety orbs agreed with the reported recommendation of the Faculty of Astrological Studies at 0.729, with the orb by aspect at 0.721 and with the uniform 6° at 0.737. The closest pairs were those of the same kind: the orb by aspect with and without the allowance for the Sun and Moon (0.904, identical lists in 23% of charts) and the Faculty's recommendation against the orb by aspect with that allowance (0.907).

For two uniform orbs the smaller list is contained in the larger, and the mean agreement was close to the ratio of the two orbs (Figure 2). A difference of 1° therefore matters more for narrow orbs than for wide ones: the agreement was 0.67 between 2° and 3°, 0.80 between 4° and 5°, 0.86 between 6° and 7° and 0.89 between 8° and 9° (Supplementary Table S2). The share of identical lists depended almost only on the difference. With a difference of 1° the two lists were identical in about 14% of charts among the ten bodies and 6% with the angles; with 2°, in about 2% and 0.5%.

Disagreement between moiety orbs and the uniform 8° was concentrated in pairs that include the Sun or the Moon. These are 17 of the 45 pairs (38%) and carried 50% of the disagreements, with a pooled agreement of 0.69 against 0.78 for the other pairs (Supplementary Table S3). Against the uniform 6° they carried 65%. Between the two uniform orbs of 8° and 6° they carried 36%, about their share of the pairs. The concentration comes from the wide moieties that the traditional rule gives the Sun and Moon, not from the luminaries as such.

3.2 The tightest aspect

The tightest aspect of the chart was the same under moiety orbs and under a uniform orb in 82.2% of charts among the ten bodies (95% interval 81.7–82.7%) and in 85.0% with the angles (Table 3). H2 is supported. The first three aspects overlapped by 0.83 on average, that is, in about one chart in two one of the three differed. Against the two aspect-dependent conventions and the Faculty's recommendation the share was 80–83%.

Between two uniform orbs the tightest aspect was the same in every chart, because the ranking by deviation does not depend on the width and the tightest aspect lay within 6° in all 20,000 charts. The instability of the "main" aspect is thus a consequence of giving different pairs different orbs, and of ranking by tightness relative to the orb.

3.3 Continuous models of strength

Scaling the strength by the orb did not bring the conventions closer (Table 4). For moiety orbs against the uniform 8°, the weighted agreement was 0.734 with the kernel scaled by the orb against 0.742 for the binary model, a difference of −0.009 (95% interval −0.010 to −0.007). The linear and Gaussian models scaled by the orb gave 0.734 and 0.735. The same held for every pair of conventions examined. H3a is supported. The reason is that the scale moves with the orb: an aspect 4° from exact has a strength of 0.56 under an orb of 8° and of 0.31 under an orb of 6°, so two conventions disagree a little about every aspect instead of entirely about a few.

The rank correlation tells a more favourable story for the same models. Spearman's correlation between the strengths of a chart under moiety orbs and under the uniform 8° rose from 0.77 for the binary model to 0.86 for the three models scaled by the orb, which share one value because they are monotone functions of the same ra-

tio. A continuous model thus preserves the order of the aspects between conventions better than a list does, while leaving their sizes as far apart.

A kernel of fixed width gave a weighted agreement of 0.999 for a width of 6°, 0.975 for 8° and 0.927 for 10°, an improvement of 0.19 to 0.26 over the binary model. The results support H3b. Most of this follows from the construction and should not be read as agreement between astrologers. When the width is not greater than the orbs, the strength no longer depends on the orb at all; the two uniform orbs of 8° and 6° then agree at exactly 1.000 with a width of 6°. The model does not reconcile two conventions. It replaces both with a third, the width. The fairest of the three comparisons is the width of 10°, above almost all the orbs compared, and there the improvement was 0.19.

3.4 Behaviour in time

At hourly resolution the binary sum changed in a mean of 2,597 intervals per chart in 2027 (range 2,326–2,772), by 1 (118,113 intervals in the 50 charts), 2 (10,961), 3 (693) and up to 6 (Table 5, Figure 3). The jumps did not go away with a finer step: at 10 minutes the sum changed in 161,337 intervals. The largest change fell only from 6 to 3 when the step was shortened sixfold.

The kernel scaled by the orb had no change greater than 0.5 at the step of 10 minutes; its largest change was 0.26. Its largest change fell by a factor of 5.80 between the two steps, close to the factor of 6 expected of a function with a bounded derivative, and the linear model by 5.70. H4 is supported, with one qualification about the step. In hourly samples the kernel still showed 618 changes above 0.5 per chart and year. All of them came from the transiting Moon, which moves about half a degree in an hour and often aspects several natal points at once; without the Moon there were none, and the largest hourly change was 0.32. These are fast changes, not jumps, and an hourly step is too coarse to tell the two apart for the Moon.

The two models that do not fall to zero at the cut-off kept the jumps. The Gaussian cut off at the orb had a ratio of 2.4 between the two steps. The kernel of fixed width 6° with the transit orb of 3° steps by 0.56 at the cut-off and produced 2,374 changes above 0.5 per chart and year in hourly samples, almost as many as the binary model. The jumps of the fixed kernel are a property of the cut-off and not of the shape: they occur when the orb is narrower than the width, so that the strength is still above zero where it is cut, and they would not occur with an orb at least as wide as the kernel. With the orbs used here, the model that agreed best between conventions in section 3.3 is therefore the one that behaves worst in time, and the model that is smooth in time is the one that did not improve agreement.

Stations. There were 17 stations of transiting planets in 2027 and 1,251 combinations of chart, station and natal point in which the pair was within orb at the station. In 622 of them the transiting planet approached, stopped and withdrew, and in 380 of those it did not come within 0.05° of the exact aspect in the 60 days before or after. The binary model gives every one of these the same value, 1, as an exact aspect. The kernel gave them a mean of 0.49 at the instant of the station, from 0.00 to 1.00 according to how near the planet came. In the example of Figure 3, transiting Jupiter stopped 1.17° short of a square to the natal Ascendant on 13 April 2027; the binary value was 1 and the kernel 0.72.

4 Discussion

An astrologer who uses moiety orbs and one who uses a uniform 8° read lists of aspects that share about three quarters of their items, and the same list in fewer than one chart in a hundred. This holds although the two conventions produce nearly the same mean number of aspects, which is the situation in which one might expect them to be interchangeable. The other conventions of ordinary width agreed with moiety orbs to a similar de-

gree (0.71 to 0.76), while closely related conventions agreed better and gave identical lists in up to 23% of charts. The differences are not confined to weak aspects at the edge of relevance: in about one chart in six the aspect ranked first is a different one.

The effect is large enough to matter for practice. An interpretation that is built, by a person or by software, from the list of aspects takes over the convention together with the list. Statements such as "the chart has a Moon–Saturn square" are true under a convention, and the convention is rarely part of the statement. Pairs with the Sun or the Moon deserve the most attention, because that is where the traditional and the modern rules differ most.

For research the consequence is a question of reporting. A study of aspects has a free parameter that changes which charts count as having the aspect, and for narrow orbs a single degree changes a third of the list. Results obtained under one convention need not transfer to another, and comparison between studies requires the convention to be known for every pair and aspect, including any allowance for the luminaries and the treatment of the angles. Studies that have varied the orb found that the result moved with it (Godbout, 2020; Tarvainen, 2020). Where an orb is chosen or estimated from the same data that are then tested, the choice is also a source of flexibility in the analysis, in addition to the dependence of the expected frequency on the orb (Hnilica, 2026).

A continuous model of strength is not a way out of the choice. Its use is elsewhere. Scaled by the orb, it keeps the convention and removes the discontinuity: the order of the aspects becomes more stable between conventions, the strength of a chart's transits becomes a continuous function of time, and an aspect that approaches without becoming exact receives a value that reflects how near it came. It does not make two conventions agree about how strong anything is. A kernel of fixed width does produce agreement, by ignoring the orb, and unless it reaches zero at the cut-off it brings the jumps back. A model can be smooth in time, or independent of the convention at a given width, and these two properties pull against each other whenever the orb still cuts the kernel off above zero.

We suggest the following for studies and software that work with aspects.

1. State the orb for every pair and aspect, including allowances for the Sun and Moon, the treatment of the angles and of bodies outside the traditional seven.
2. Report the main result under at least two conventions of different kinds, for example one that depends on the pair and one uniform, and say whether it holds under both.
3. Report the number of aspects per chart under each convention, and do not treat equal numbers as equal lists.
4. Where strength is modelled continuously, give the function and state what it is scaled by. Use a function that reaches zero at the cut-off if the quantity is followed in time.
5. For transits of the Moon, sample at steps shorter than an hour.

5 Limitations

Sample. The births are synthetic and uniform in time over 201 years. Real samples are concentrated in a few decades, in which the slow planets hold particular aspects; the agreement between conventions in such a sample may differ from the figures here. Places were weighted by the population given in the gazetteer, which refers to administrative units of uneven size; this affects only the results with the angles, through the distribution of latitudes.

Conventions. The study compares nine selected orb conventions. The orbs of the outer planets and the angles under the moiety convention are those of one software engine. The recommendation of the Faculty of Astrological Studies was taken from a secondary source. Minor aspects were not included; with them, overlapping windows would add a further source of disagreement.

Measures. The Jaccard index treats every aspect as equal. Agreement was measured between lists of aspects, not between interpretations, and how far a difference in the list changes what an astrologer would say was not studied. The ranking by relative tightness is one of several possible definitions of the main aspect.

Models. The continuous models are a selection of simple shapes. The improvement under a kernel of fixed width depends on the relation between the width and the orbs and is partly a property of the construction.

Time series. The time series covered 50 charts and one year, with the transit orb of one engine. A threshold of 0.5 on the change is arbitrary; the test by scaling with the step does not depend on it.

Positions. For future dates the chart angles depend on a prediction of the Earth's rotation, and differ by up to 1.4° between the two programs compared. The agreement figures were the same with both.

Hypotheses. The hypotheses were written after a pilot on a different sample, which had already suggested H1, H2 and H3a, and were not preregistered.

Literature. On 28 November 2026 we searched Google Scholar for studies of orb conventions and of agreement between aspect lists, and the abstracts on the website of the journal *Correlation*. Scopus and Web of Science were not searched, and much of the astrological literature is not indexed, so earlier work of this kind may exist.

6 Conclusion

The list of aspects in a chart is a joint product of the sky and of an orb convention. Moiety orbs and a uniform 8° orb produced nearly the same mean number of aspects per chart, yet their lists shared about three quarters of their aspects, were identical in only 0.88% of charts, and in about one chart in six put a different aspect first. Closely related conventions agreed better, with identical lists in up to 23% of charts. A continuous model of strength made the order of aspects more stable and the behaviour in time smooth, but did not make conventions agree unless it ignored the orb. The results support a simple practice: state the orb for every pair, and report whether a finding holds under more than one convention.

Statements

Conflict of interest. The author develops Twelvera, a commercial astrology application. Its chart engine computed the positions used here, the moiety convention and the transit orb are those of that engine, and the kernel scaled by the orb is the function used in one of its charts. The positions were recomputed with independent software.

Use of AI tools. The author defined the research questions and the design, directed the computational analysis, and reviewed the results and the manuscript. An AI assistant (Claude, Anthropic) wrote the analysis code, ran the computations, assisted with the literature search, and drafted and edited the text. The author takes full responsibility for the content.

Data and materials. The positions for the 20,000 synthetic births, the sky of 2027 at steps of 10 minutes, the list of places, all result tables and the analysis code are available at https://github.com/etruhla/twelvera-research in the folder `orb-conventions`.

Ethics. The study used no data about people.

Funding. No external funding.

Author contributions. Sole author.

References

GeoNames. (n.d.). *GeoNames geographical database* [Data set]. Retrieved 25 November 2026, from https://www.geonames.org/

Godbout, V. (2020). An automated matching test: Comparing astrological charts with biographies. *Correlation, 32*(2), 13–42.

Hnilica, V. (2026). *What should chance look like? Base rates of planetary aspects, 1900–2100, and false positives in aspect studies* [Preprint]. Zenodo. https://doi.org/10.5281/zenodo.24633982

Jaccard, P. (1912). The distribution of the flora in the alpine zone. *New Phytologist, 11*(2), 37–50. https://doi.org/10.1111/j.1469-8137.1912.tb05611.x

Koch, D., & Treindl, A. (n.d.). *Swiss Ephemeris* [Computer software]. Astrodienst. https://www.astro.com/swisseph/

Lilly, W. (1647). *Christian astrology*. London.

Park, R. S., Folkner, W. M., Williams, J. G., & Boggs, D. H. (2021). The JPL planetary and lunar ephemerides DE440 and DE441. *The Astronomical Journal, 161*(3), Article 105. https://doi.org/10.3847/1538-3881/abd414

Silverman, B. W. (1986). *Density estimation for statistics and data analysis*. Chapman and Hall. https://doi.org/10.1201/9781315140919

Tarvainen, K. (2020). Estimation of aspect orbs by the computer. *Correlation, 32*(2), 55–62.

Tables

Table 1

The nine orb conventions and the number of major aspects per chart

Convention	Orb	Ten bodies, 45 pairs: mean (SD)	With the angles, 65 pairs: mean (SD)
Moiety orbs (L)	Sum of the moieties of the two points, at most 6° outside the traditional seven	15.70 (3.15)	21.04 (3.70)
Uniform 2° (F2)	2° for every pair and aspect	3.96 (1.90)	5.76 (2.29)
Uniform 4° (F4)	4°	7.91 (2.54)	11.49 (3.07)
Uniform 6° (F6)	6°	11.86 (2.94)	17.20 (3.52)
Uniform 8° (F8)	8°	15.81 (3.20)	22.92 (3.79)
Uniform 10° (F10)	10°	19.70 (3.34)	28.60 (3.93)
By aspect (AD)	Conjunction and opposition 8°, square and trine 7°, sextile 5°	13.30 (3.03)	19.31 (3.66)
By aspect with luminaries (AD+L)	As AD, plus 2° with the Sun or Moon	14.71 (3.12)	21.09 (3.74)
Faculty of Astrological Studies, as reported (FAS)	Conjunction, square, trine and opposition 8°, sextile 4°, plus 2° with the Sun or Moon	15.06 (3.15)	21.66 (3.79)

Note. N = 20,000 synthetic births. Moieties: Sun 8.5°, Moon 6.25°, Mercury 3.5°, Venus 4°, Mars 3.75°, Jupiter 6°, Saturn 5°, Uranus, Neptune and Pluto 2.5°, Ascendant and Midheaven 5°.

Table 2

Agreement between the aspect lists of two conventions

Conventions	Ten bodies: mean Jaccard (95% interval)	Ten bodies: identical lists (%)	With the angles: mean Jaccard (95% interval)	With the angles: identical lists (%)
Moiety and uniform 8°	0.742 (0.741–0.744)	0.88	0.745 (0.744–0.746)	0.19
Moiety and uniform 6°	0.737 (0.736–0.738)	1.55	0.803 (0.802–0.804)	1.55
Moiety and uniform 10°	0.713 (0.711–0.714)	0.34	0.679 (0.678–0.680)	0.03
Moiety and by aspect	0.721 (0.719–0.722)	0.83	0.748 (0.747–0.750)	0.33
Moiety and by aspect with luminaries	0.757 (0.756–0.759)	1.33	0.766 (0.765–0.767)	0.32
Moiety and FAS	0.729 (0.728–0.731)	0.81	0.726 (0.725–0.728)	0.10
Uniform 8° and uniform 6°	0.751 (0.749–0.753)	2.15	0.751 (0.750–0.752)	0.50
Uniform 8° and FAS	0.829 (0.828–0.830)	5.37	0.837 (0.836–0.838)	1.98
By aspect and by aspect with luminaries	0.904 (0.903–0.905)	22.90	0.916 (0.915–0.917)	15.71
By aspect with luminaries and FAS	0.907 (0.906–0.908)	23.27	0.906 (0.905–0.907)	11.56

Note. Mean over 20,000 charts of the Jaccard index between the two lists of major aspects, and the share of charts in which the lists are identical. FAS = recommendation of the Faculty of Astrological Studies as reported by Tarvainen (2020).

Table 3

Stability of the tightest aspects between conventions

Conventions	Ten bodies: same tightest aspect, % (95% interval)	Ten bodies: mean overlap of the first three	Ten bodies: same first three (%)	With the angles: same tightest aspect, % (95% interval)
Moiety and any uniform orb	82.2 (81.7–82.7)	0.83	53.3	85.0 (84.5–85.5)
Moiety and by aspect	81.0 (80.5–81.5)	0.82	50.5	82.4 (81.9–82.9)
Moiety and by aspect with luminaries	83.1 (82.6–83.7)	0.84	54.8	83.7 (83.2–84.2)
Moiety and FAS	80.2 (79.6–80.7)	0.82	49.3	80.8 (80.2–81.3)
Any uniform orb and by aspect	91.5 (91.1–91.9)	0.91	74.9	91.7 (91.3–92.1)
Any uniform orb and by aspect with luminaries	89.3 (88.8–89.7)	0.89	69.2	89.3 (88.9–89.8)
Any uniform orb and FAS	85.9 (85.4–86.4)	0.86	61.5	86.3 (85.8–86.7)
Two uniform orbs	100.0 (100.0–100.0)	1.00	100.0	100.0 (100.0–100.0)

Note. Aspects ranked within a chart by the deviation divided by the orb. Rows for "any uniform orb" hold for 4°, 6°, 8° and 10°, for which the ranking is the same. Wilson intervals; N = 20,000.

Table 4

Agreement between conventions under binary and continuous models of strength, ten bodies

Model of strength	Moiety and uniform 8°: weighted Jaccard (95% interval)	Moiety and uniform 8°: Spearman	Moiety and FAS: weighted Jaccard	Moiety and by aspect: weighted Jaccard	Uniform 8° and 6°: weighted Jaccard
Binary (aspect list)	0.742 (0.741–0.744)	0.77	0.729	0.721	0.751
Kernel scaled by the orb	0.734 (0.733–0.734)	0.86	0.722	0.713	0.742
Linear, scaled by the orb	0.734 (0.733–0.735)	0.86	0.723	0.713	0.743
Gaussian, σ = orb/2	0.735 (0.734–0.736)	0.86	0.723	0.714	0.743
Kernel of fixed width 6°	0.999 (0.999–0.999)	0.99	0.985	0.997	1.000
Kernel of fixed width 8°	0.975 (0.975–0.975)	0.94	0.947	0.963	0.965
Kernel of fixed width 10°	0.927 (0.927–0.928)	0.91	0.897	0.913	0.895
Gaussian, fixed σ = 3°	0.970 (0.969–0.970)	0.88	0.948	0.961	0.959

Note. Weighted Jaccard index: sum over the 45 pairs of the smaller strength divided by the sum of the larger, mean over 20,000 charts. Spearman: rank correlation of the two vectors of strengths within a chart, mean over charts.

Table 5

Changes of the total transit strength of a chart between neighbouring samples, 2027

Model of strength	Intervals with a change above 0.5 per chart in the year, hourly step: mean (range)	Intervals with a change above 0.5 in 50 charts, 10-minute step	Largest change, hourly step	Largest change, 10-minute step	Ratio
Binary (count of aspects in orb)	2,597 (2,326–2,772)	161,337	6.00	3.00	2.00
Kernel scaled by the orb	618 (146–1,528)	0	1.51	0.26	5.80
Linear, scaled by the orb	359 (61–1,147)	0	1.22	0.21	5.70
Gaussian, σ = orb/2, cut at the orb	459 (103–1,284)	2	1.27	0.52	2.43
Kernel of fixed width 6°, cut at the orb	2,374 (2,102–2,616)	161,246	3.69	2.18	1.70

Note. Fifty charts, 120 pairs per chart, transit orb 3° (sextile 2°). A change is the absolute difference of the total strength between two neighbouring samples. Ratio = largest change at the hourly step divided by the largest change at the 10-minute step. A ratio near 6 is expected of a function with a bounded derivative; for a function with isolated jumps the largest sampled change approaches the largest jump as the step shortens. Counts are counts of intervals between neighbouring samples in which the total changed by more than 0.5.

Figures

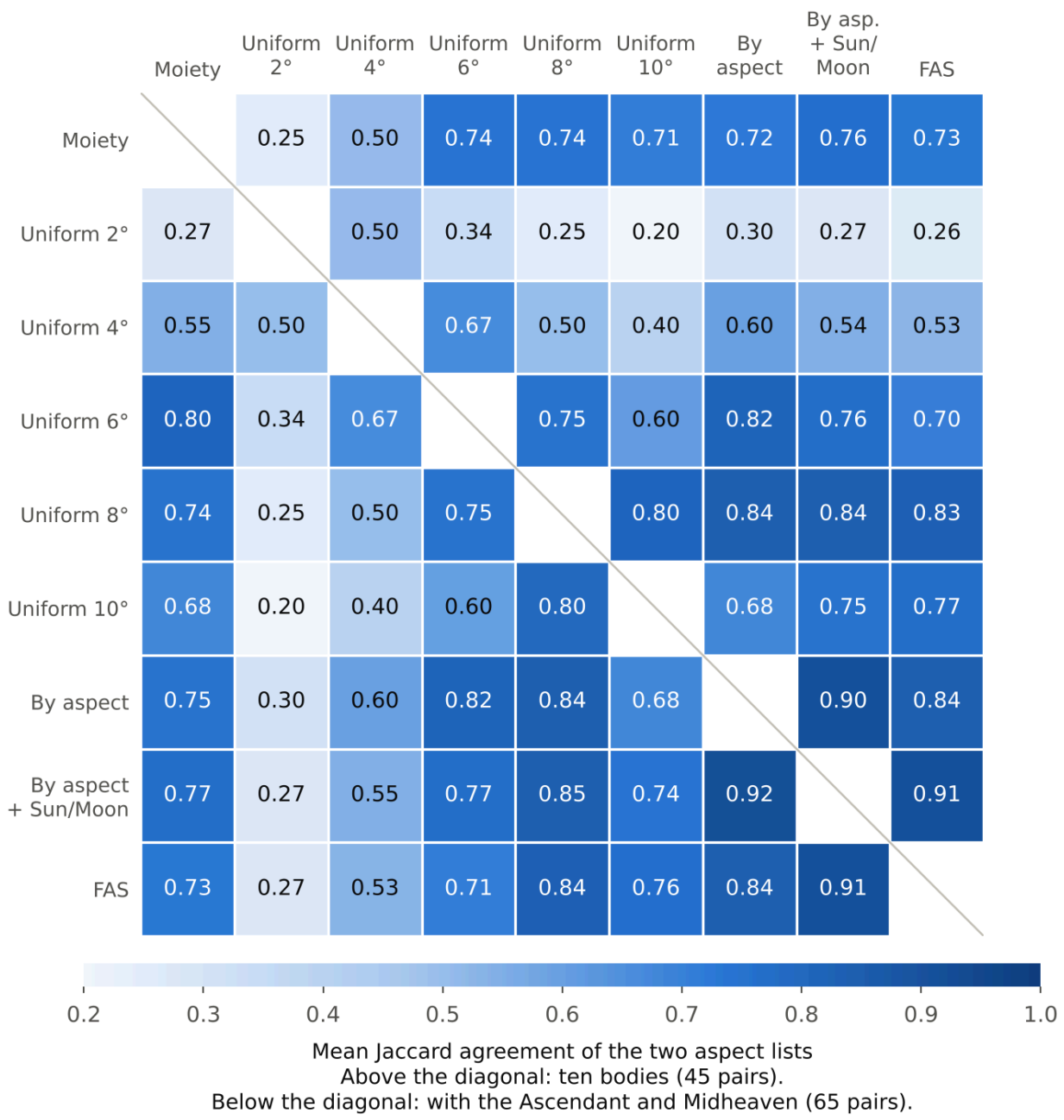


Figure 1. Mean Jaccard agreement between the lists of major aspects under nine orb conventions, 20,000 synthetic births. Above the diagonal: the 45 pairs among the ten bodies. Below the diagonal: 65 pairs, with the Ascendant and Midheaven. FAS = recommendation of the Faculty of Astrological Studies as reported by Tarvainen (2020); “By aspect + Sun/Moon” is the convention AD+L.

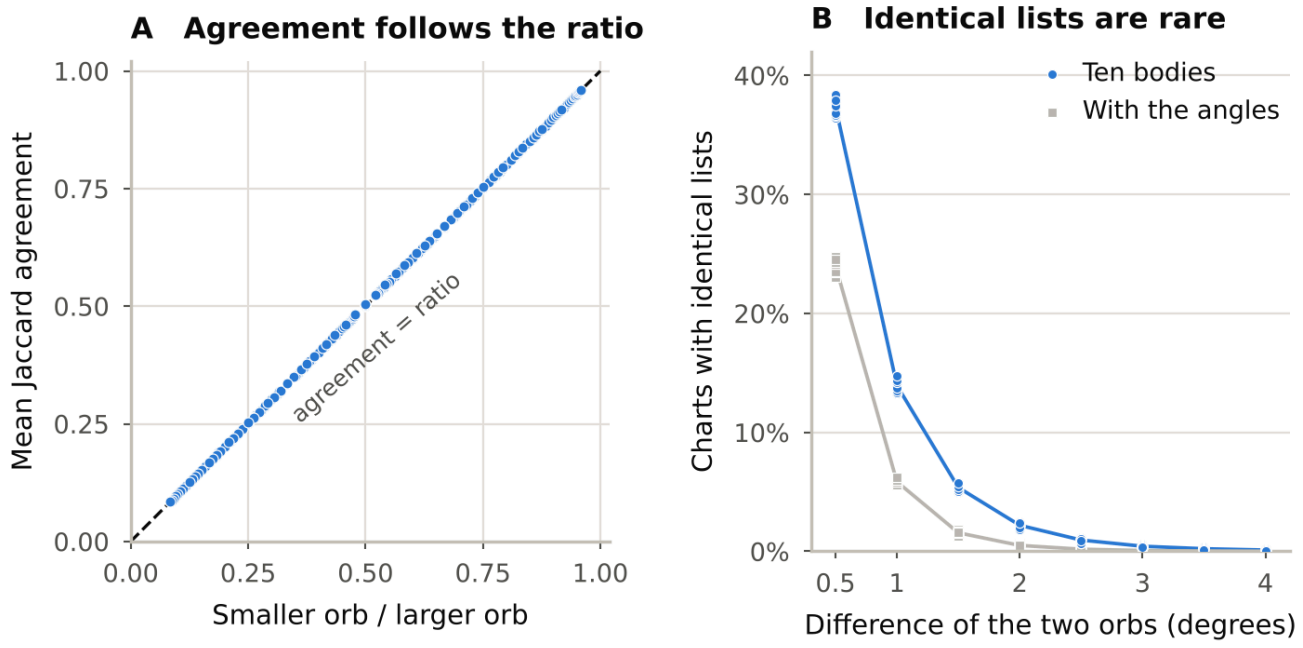


Figure 2. Agreement between two uniform orbs, for all 253 pairs of orbs between 1° and 12° in steps of 0.5°. A: mean Jaccard agreement against the ratio of the smaller to the larger orb, 65 pairs with the angles; the dashed line marks equality. B: share of charts in which the two lists are identical, against the difference between the two orbs, up to 4°; each point is one pair of orbs and the line joins the medians.

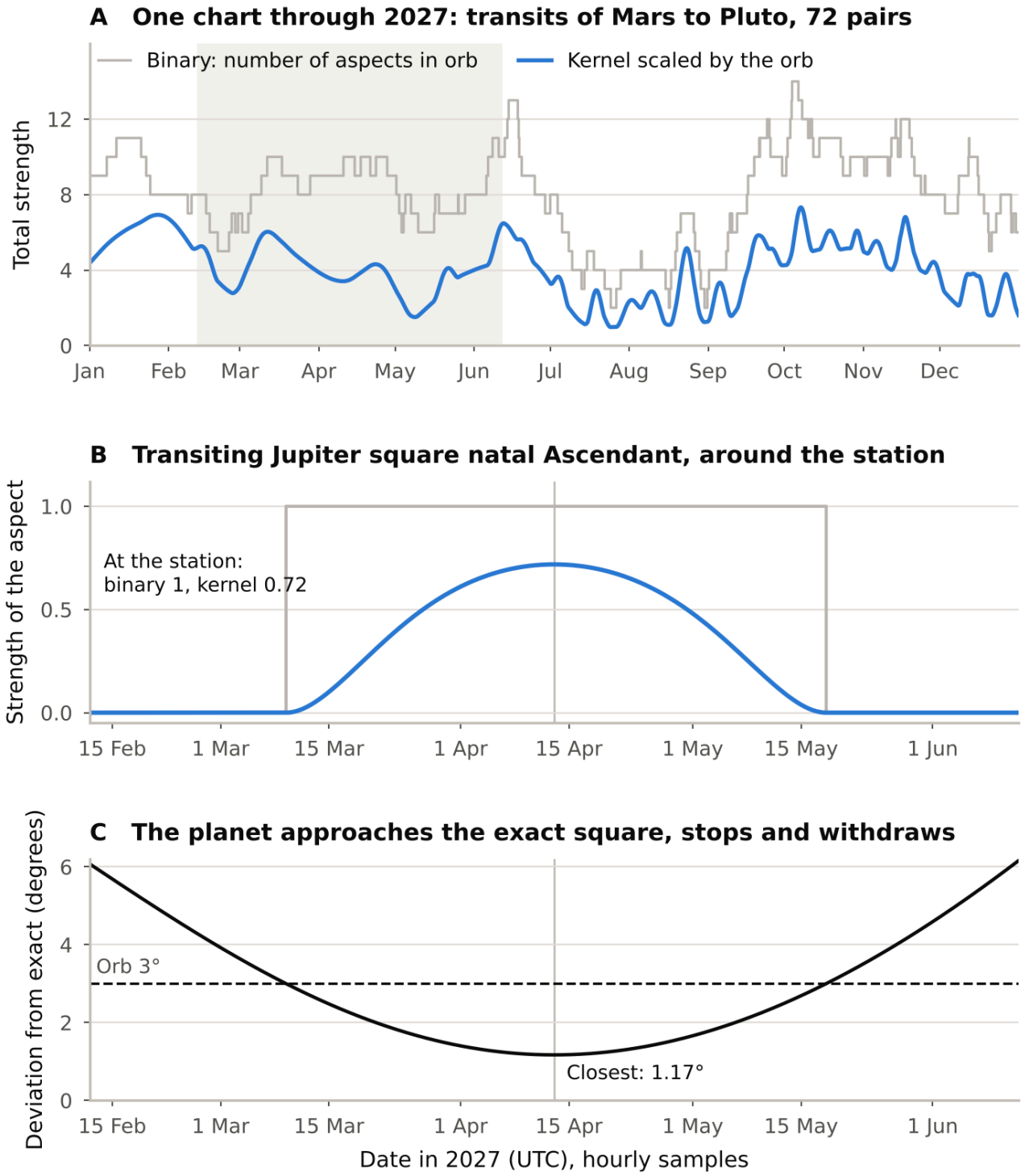


Figure 3. Binary and continuous strength in time. A: total strength of the transits of Mars, Jupiter, Saturn, Uranus, Neptune and Pluto to the twelve natal points of one chart of the sample through 2027, as the number of aspects in orb and as the sum of the kernel scaled by the orb; the faster bodies are left out for legibility. The shaded band is the period shown below. B: strength of one aspect, transiting Jupiter square the natal Ascendant, around the station of Jupiter on 13 April 2027 (vertical line). C: deviation of the same aspect from exactness; the dashed line is the transit orb of 3°.

Supplementary tables

Table S1

Agreement for all 36 pairs of the nine conventions

Conventions	Ten bodies: mean Jaccard	Ten bodies: identical lists (%)	With the angles: mean Jaccard	With the angles: identical lists (%)	Ten bodies: same tightest aspect (%)
L and F2	0.2527	0.00	0.2737	0.00	82.56
L and F4	0.5039	0.07	0.5460	0.02	82.21
L and F6	0.7370	1.55	0.8032	1.55	82.21
L and F8	0.7423	0.88	0.7449	0.19	82.21
L and F10	0.7125	0.34	0.6788	0.03	82.21
L and AD	0.7208	0.83	0.7483	0.33	81.01
L and AD+L	0.7573	1.33	0.7660	0.32	83.14
L and FAS	0.7294	0.81	0.7264	0.10	80.16
F2 and F4	0.5033	2.20	0.5025	0.51	100.00
F2 and F6	0.3352	0.04	0.3353	0.01	100.00
F2 and F8	0.2514	0.00	0.2515	0.00	100.00
F2 and F10	0.2019	0.00	0.2017	0.00	100.00
F2 and AD	0.2986	0.01	0.2986	0.00	91.73
F2 and AD+L	0.2698	0.00	0.2733	0.00	89.54
F2 and FAS	0.2637	0.00	0.2662	0.00	86.16
F4 and F6	0.6679	2.19	0.6682	0.46	100.00
F4 and F8	0.5012	0.11	0.5017	0.03	100.00
F4 and F10	0.4027	0.04	0.4024	0.01	100.00
F4 and AD	0.5953	0.52	0.5954	0.09	91.53
F4 and AD+L	0.5382	0.15	0.5452	0.03	89.27
F4 and FAS	0.5259	0.14	0.5310	0.03	85.93
F6 and F8	0.7510	2.15	0.7510	0.50	100.00
F6 and F10	0.6033	0.20	0.6025	0.03	100.00
F6 and AD	0.8176	8.12	0.8192	2.66	91.53
F6 and AD+L	0.7619	2.80	0.7701	0.76	89.27
F6 and FAS	0.7031	1.17	0.7079	0.27	85.93
F8 and F10	0.8034	2.34	0.8021	0.53	100.00
F8 and AD	0.8420	8.33	0.8425	2.96	91.53
F8 and AD+L	0.8444	7.23	0.8453	2.37	89.27
F8 and FAS	0.8288	5.37	0.8367	1.98	85.93
F10 and AD	0.6764	0.34	0.6758	0.04	91.53
F10 and AD+L	0.7479	1.00	0.7378	0.12	89.27
F10 and FAS	0.7651	1.23	0.7576	0.18	85.93
AD and AD+L	0.9042	22.90	0.9157	15.71	93.77
AD and FAS	0.8376	8.04	0.8447	3.15	91.31
AD+L and FAS	0.9073	23.27	0.9058	11.56	93.94

Note. Abbreviations as in Table 1. The tightest aspect is compared in charts where both conventions give at least one aspect.

Table S2

Agreement between two uniform orbs that differ by 1°, 2° and 4°

Smaller orb (degrees)	Larger orb (degrees)	Difference (degrees)	Ten bodies: mean Jaccard	Ten bodies: identical lists (%)	With the angles: mean Jaccard	With the angles: identical lists (%)
1	2	1	0.505	13.29	0.500	5.71
2	3	1	0.670	13.86	0.669	6.05
3	4	1	0.752	13.73	0.751	5.79
4	5	1	0.800	13.64	0.801	5.70
5	6	1	0.835	13.38	0.834	5.63
6	7	1	0.857	13.79	0.857	5.71
7	8	1	0.876	13.94	0.876	6.17
8	9	1	0.891	14.25	0.890	6.11
9	10	1	0.902	14.24	0.901	5.85
10	11	1	0.911	14.24	0.910	5.80
11	12	1	0.919	14.79	0.918	6.24
1	3	2	0.336	1.81	0.334	0.43
2	4	2	0.503	2.20	0.502	0.51
3	5	2	0.601	2.19	0.601	0.50
4	6	2	0.668	2.19	0.668	0.46
5	7	2	0.715	2.07	0.715	0.45
6	8	2	0.751	2.15	0.751	0.50
7	9	2	0.781	2.26	0.780	0.62
8	10	2	0.803	2.34	0.802	0.53
9	11	2	0.822	1.83	0.820	0.28
10	12	2	0.837	2.35	0.836	0.48
1	5	4	0.201	0.01	0.201	0.00
2	6	4	0.335	0.04	0.335	0.01
3	7	4	0.429	0.14	0.430	0.01
4	8	4	0.501	0.11	0.502	0.03
5	9	4	0.558	0.17	0.558	0.03
6	10	4	0.603	0.20	0.603	0.03
7	11	4	0.641	0.10	0.640	0.01
8	12	4	0.672	0.04	0.670	0.00

Note. Whole-degree orbs from the comparison of 253 pairs of uniform orbs between 1° and 12°.

Table S3

Where two conventions disagree, by group of pairs

Conventions	Group of pairs	Pairs	Pooled Jaccard	Share of disagreements among the ten bodies (%)
Moiety and uniform 8°	Fast with fast	10	0.752	21.61
Moiety and uniform 8°	Fast with slow	25	0.750	53.90
Moiety and uniform 8°	Slow with slow	10	0.710	24.49
Moiety and uniform 8°	Body with an angle	20	0.751	–
Moiety and uniform 8°	With the Sun or Moon	17	0.688	50.02
Moiety and uniform 8°	Without the Sun or Moon	28	0.779	49.98
Moiety and uniform 6°	Fast with fast	10	0.584	40.13
Moiety and uniform 6°	Fast with slow	25	0.760	50.40
Moiety and uniform 6°	Slow with slow	10	0.873	9.47
Moiety and uniform 6°	Body with an angle	20	1.000	–
Moiety and uniform 6°	With the Sun or Moon	17	0.611	65.06
Moiety and uniform 6°	Without the Sun or Moon	28	0.836	34.94
Moiety and FAS	Fast with fast	10	0.784	18.18
Moiety and FAS	Fast with slow	25	0.714	59.90
Moiety and FAS	Slow with slow	10	0.706	21.92
Moiety and FAS	Body with an angle	20	0.719	–
Moiety and FAS	With the Sun or Moon	17	0.722	44.68
Moiety and FAS	Without the Sun or Moon	28	0.734	55.32
Uniform 8° and uniform 6°	Fast with fast	10	0.750	19.79
Uniform 8° and uniform 6°	Fast with slow	25	0.749	56.34
Uniform 8° and uniform 6°	Slow with slow	10	0.753	23.87
Uniform 8° and uniform 6°	Body with an angle	20	0.751	–
Uniform 8° and uniform 6°	With the Sun or Moon	17	0.749	36.09
Uniform 8° and uniform 6°	Without the Sun or Moon	28	0.751	63.91

Note. Fast: Sun, Moon, Mercury, Venus, Mars. Slow: Jupiter to Pluto. The first three groups and the last two are two divisions of the same 45 pairs; a disagreement is an aspect present under one convention only. Under moiety orbs and under the uniform 6° every aspect to an angle has an orb of 6°, so these two agree fully on the angles.