

6th-column in source files

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Data format 1

Jiang-san's email

The start time is the beginning of the year 2016.0.

The format of the file is as follows.

1st column: the day since the cycle start

2nd column: latitude of positive polarity

3rd column: longitude of positive polarity

4th column: latitude of negative polarity

5th column: longitude of negative polarity

6th column: area of the sunspot groups

(umbra+penumbra+faculae) in degree², which

can be changed to millionth hemisphere area

by dividing 0.5×0.041253 . I suppose our magnetic

field distributions are not exactly the same. What

I did is same as Baumann et al.(2004).

ActiveRegionRecord2Lisa.107

==> ActiveRegionRecord2Lisa.107 <==					
#Day	+Lat	+Long	-Lat	-Long	d/deg
2596	-2.5452	196.0718	-2.0418	192.7798	3.3277
2598	-7.5414	288.5524	-8.2395	286.8873	1.7910
2599	-4.5171	216.6101	-4.5916	214.4622	2.1424
2602	14.7376	159.1701	14.8907	160.8600	1.6409
2603	-21.3769	31.8299	-21.6050	26.1165	5.3211
2605	13.0967	243.3235	13.4049	244.9792	1.6409
2607	12.9797	318.3947	11.6249	324.1292	5.7642
2608	12.0133	184.0656	12.8983	189.9634	5.8267
2609	13.1525	14.3308	12.8474	25.0899	10.4878

Data format 2

Jiang-san's email

Since Lisa requested the flux of each BMR in my source term last time I sent, I attached it here as well. This is an extreme case for the dipole field generation.

ActiveRegionRecord.dat

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==> ActiveRegionRecord.dat <==
#Day      +Lat      +Long      -Lat      -Long      Flux in 1e21 Mx
2596      -2.5452    196.0718    -2.0418    192.7798    6.0445
2598      -7.5414    288.5524    -8.2395    286.8873    0.9843
2599      -4.5171    216.6101    -4.5916    214.4622    1.6769
2602      14.7376    159.1701    14.8907    160.8600    0.7529
2603     -21.3769     31.8299   -21.6050     26.1165   21.5245
2605      13.0967    243.3235    13.4049    244.9792    0.7535
2607      12.9797    318.3947    11.6249    324.1292   26.9678
2608      12.0133    184.0656    12.8983    189.9634   27.5568
2609      13.1525     14.3308    12.8474     25.0899  120.4368
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Derivation of separation and inclination

From the analogous equations in Cameron et al. (2010) (Eq. (4)–(7)),

$$\lambda_{\pm} = \lambda \pm \frac{1}{2} \Delta\beta \sin \alpha$$

$$\phi_{\pm} = \phi \pm \frac{1}{2} \Delta\beta \cos \alpha (\cos \lambda)^{-1}$$

I derived the separation between the two polarities $\Delta\beta$ and the tilt angle respect to the azimuthal direction α as follows:

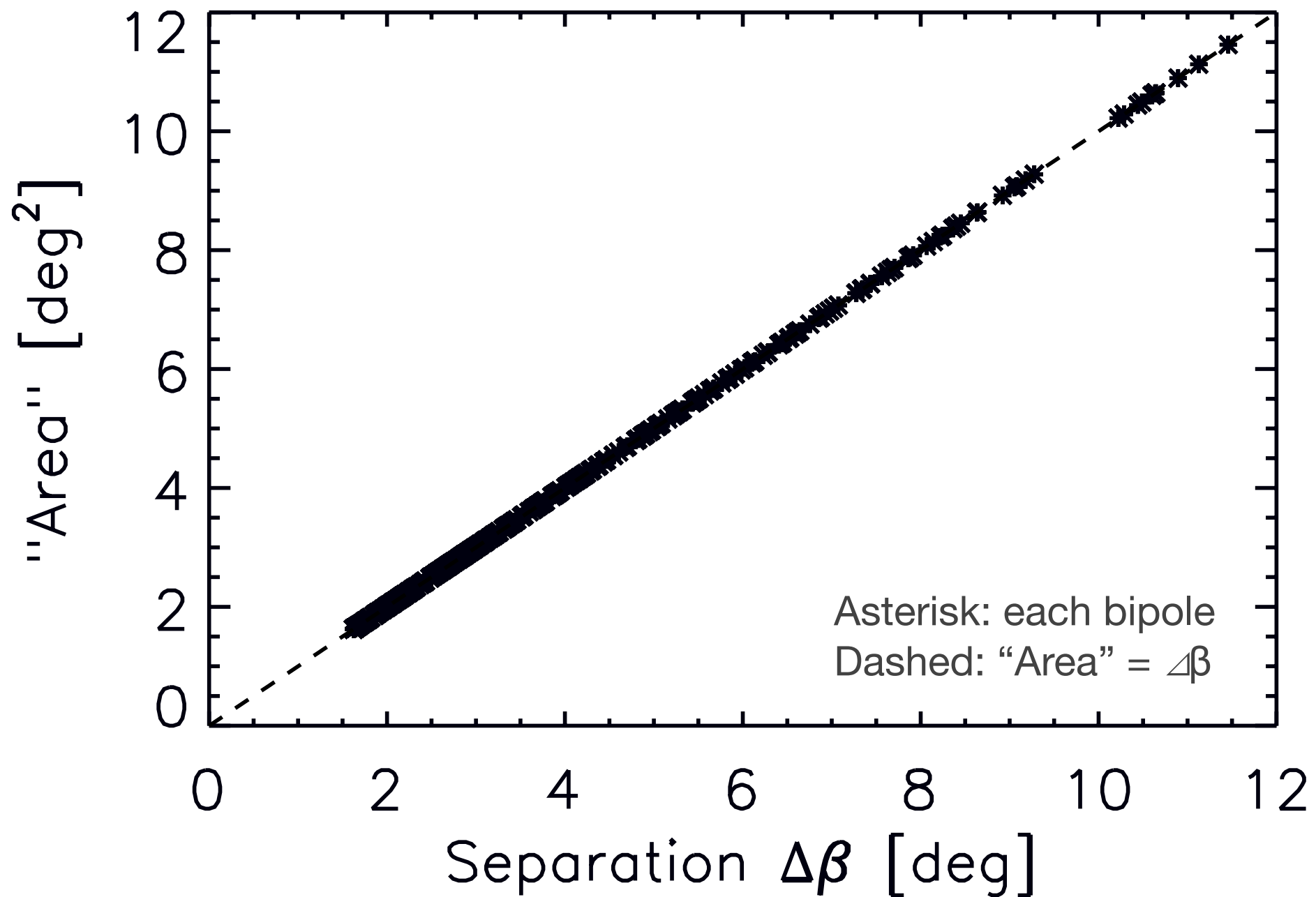
$$\lambda = (\lambda_+ + \lambda_-)/2, \quad \phi = (\phi_+ + \phi_-)/2$$

$$\Delta\lambda = |\lambda_+ - \lambda_-|, \quad \Delta\phi = |\phi_+ - \phi_-|$$

$$\tan \alpha = \frac{\Delta\lambda}{\Delta\phi \cos \lambda}$$

$$\Delta\beta = \sqrt{\Delta\lambda^2 + \Delta\phi^2 \cos^2 \lambda}$$

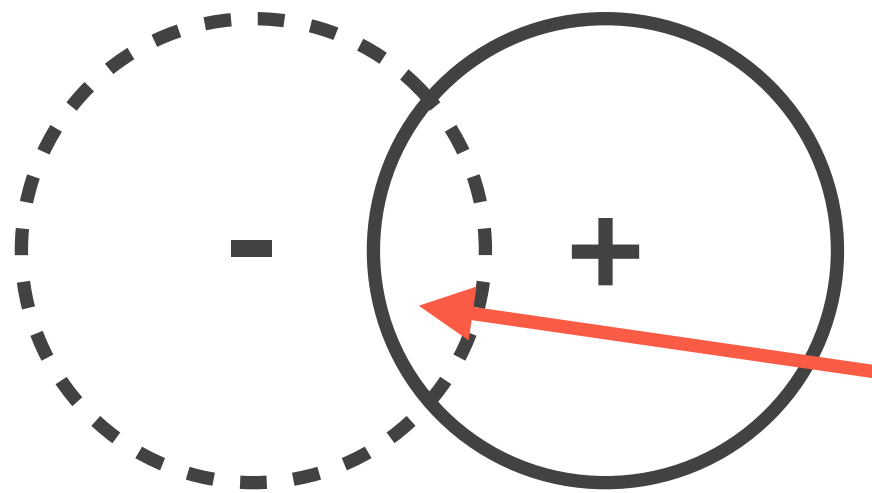
Separation v.s. 6th column in 1st source file



"Area" is not the total area of sunspot group?

How can we define the flux in each BMR?

The total unsigned flux of each BMR will depend on the actual size of the individual polarity patches (δ of Eq. (3) in Cameron et al., 2010 or δ_0 of Eq. (6) in Baumann et al., 2004).



This region is cancelled and the total unsigned flux decrease.

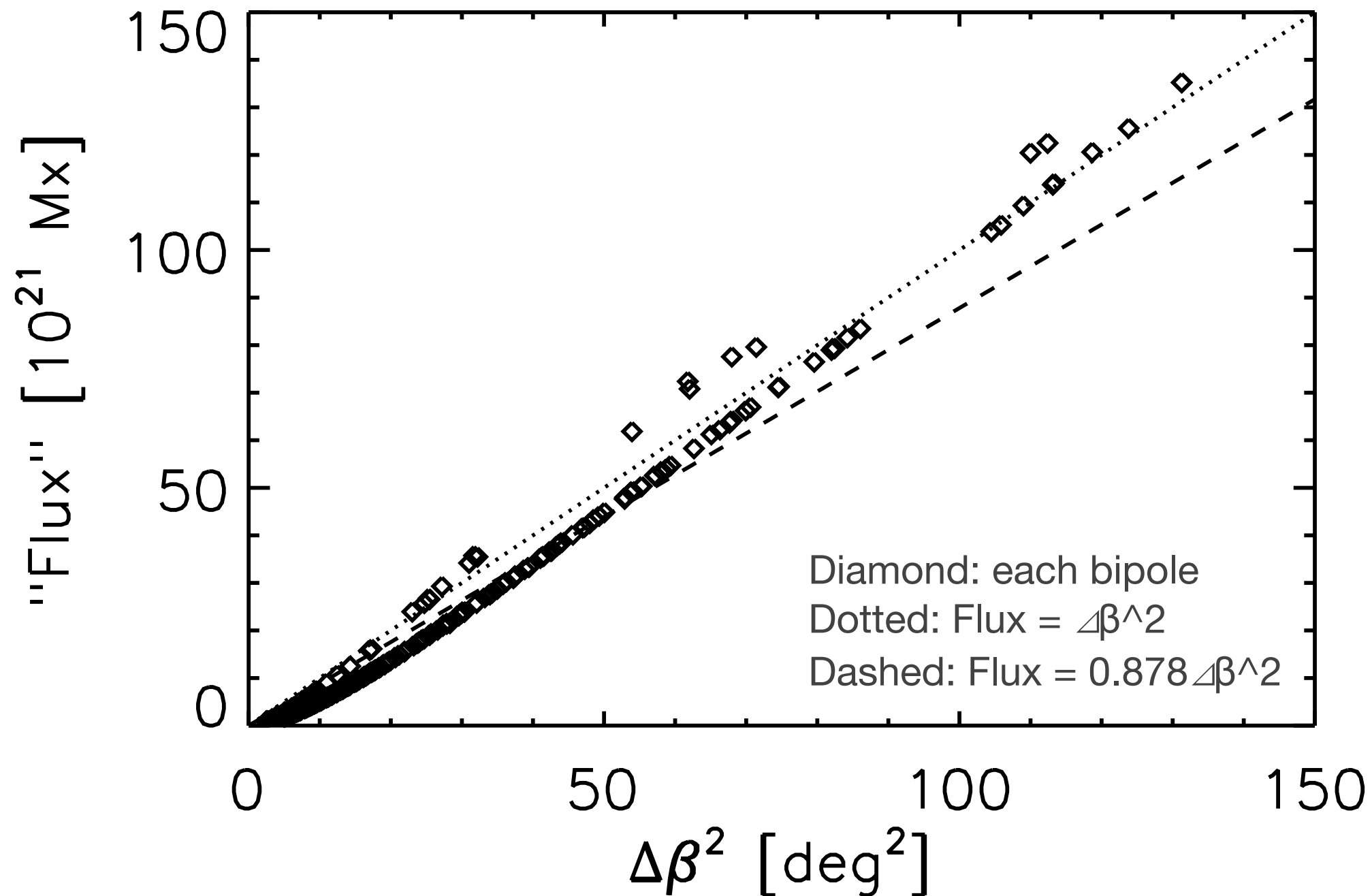
In the formulation of Eq. (5) in Baumann et al. (2004) using the actual (or initial) size of BMR δ_{in} , the cancelled flux is smaller than 10%.

If we neglect the cancelation, the total flux (double of each pole's flux) is approximately (within a few % error) derived as:

$$\begin{aligned}\Phi_{\text{BMR}} &= 2 \times \pi B_{\text{max}} R^2 (\delta_{\text{in}} [\text{rad}])^2 \\ &= 5.488 \times (\delta_{\text{in}} [\text{deg}])^2 [10^{21} \text{ Mx}] \\ &= 0.878 \times (\Delta\beta [\text{deg}])^2 [10^{21} \text{ Mx}]\end{aligned}$$

where I assume
 $B_{\text{max}} = 592 \text{ G}$
 and
 $\delta_{\text{in}} = 0.4 \Delta\beta$.

Separation v.s. 6th column in 2nd source file



"Flux" does not follow single curve nor line?
Flux = $\Delta\beta^2$ indicates $B_{\text{max}} = 674 \text{ G}$?