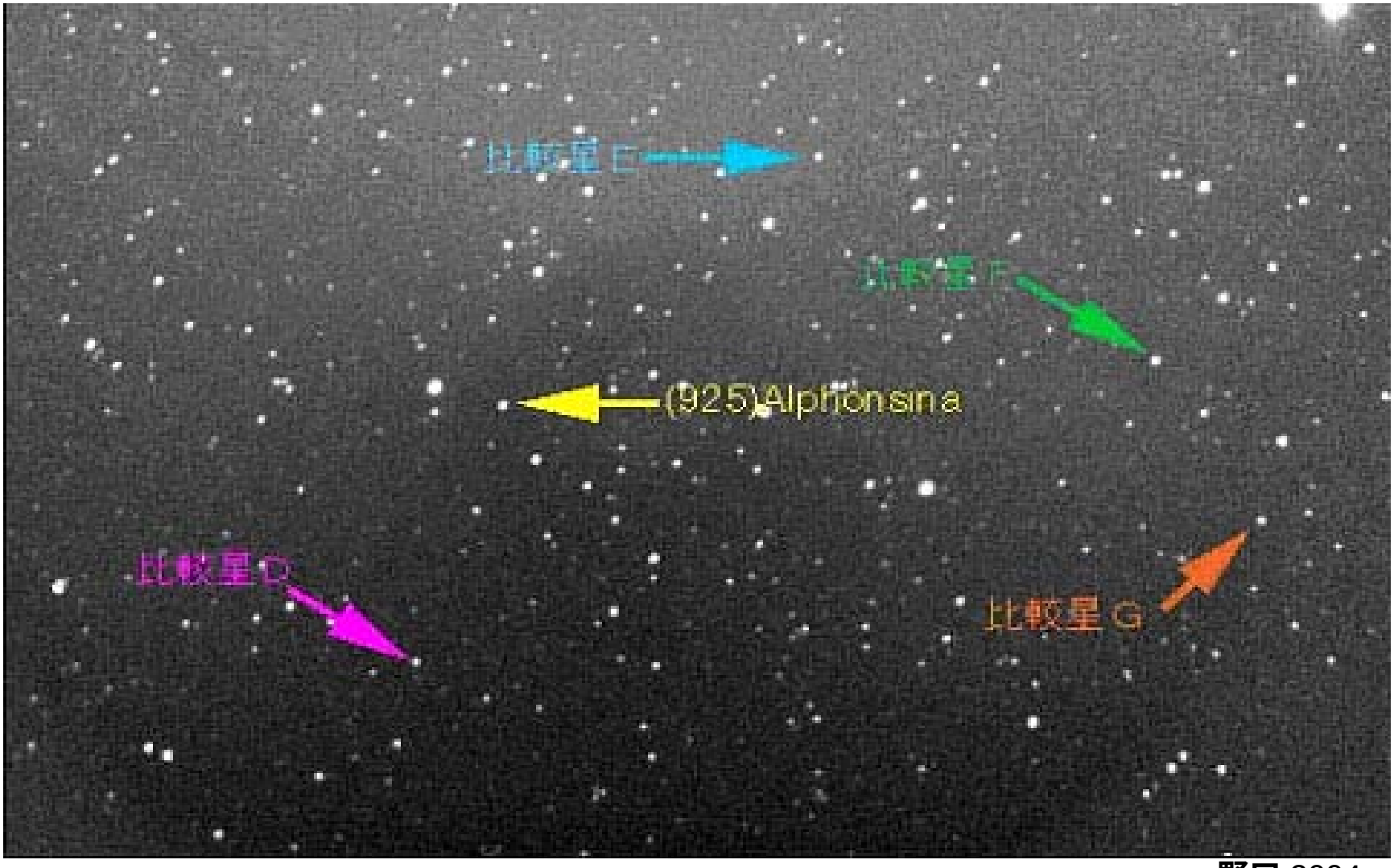
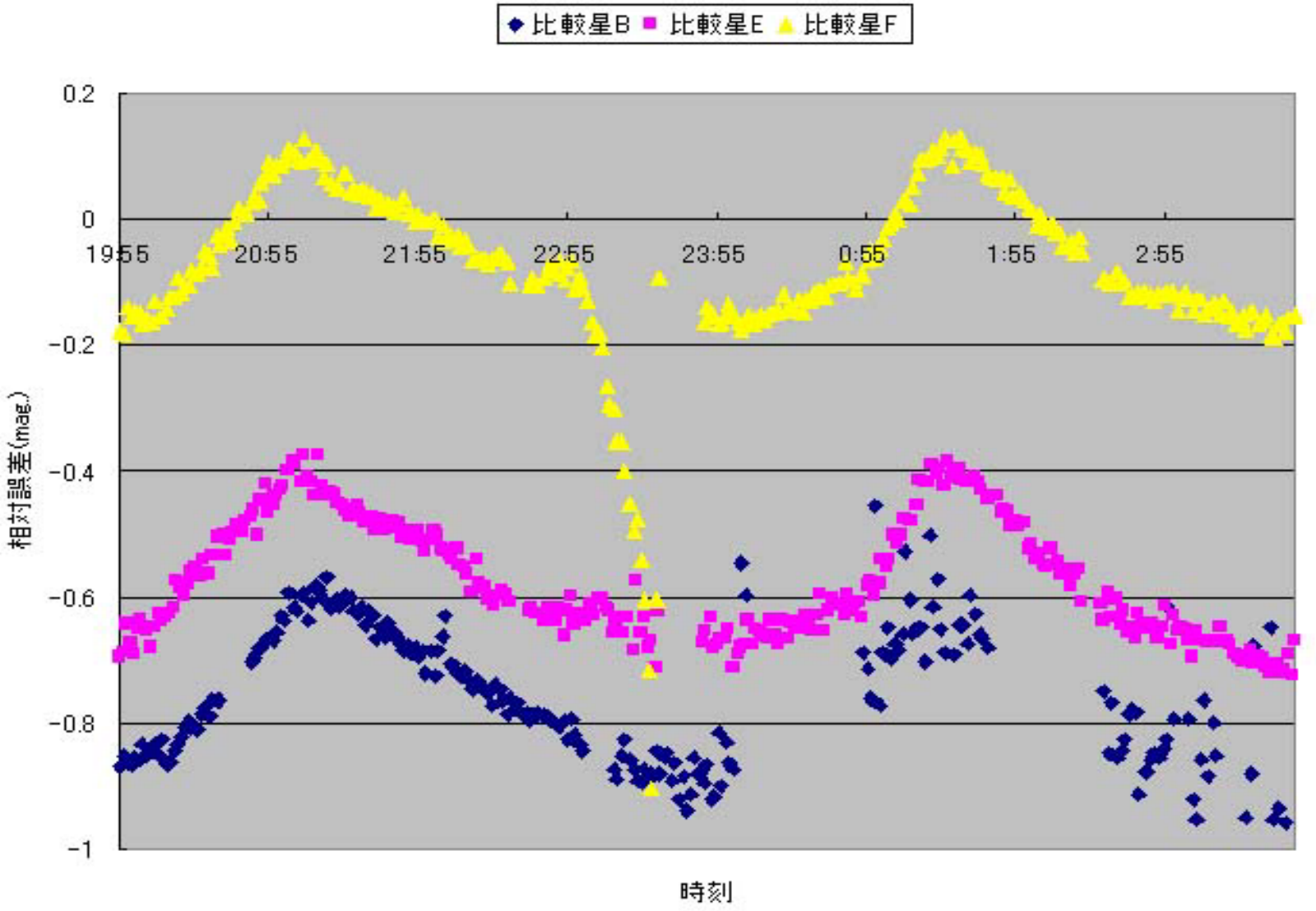
箱根天体力学N体力学研究会 (2004.3)

小惑星の自転

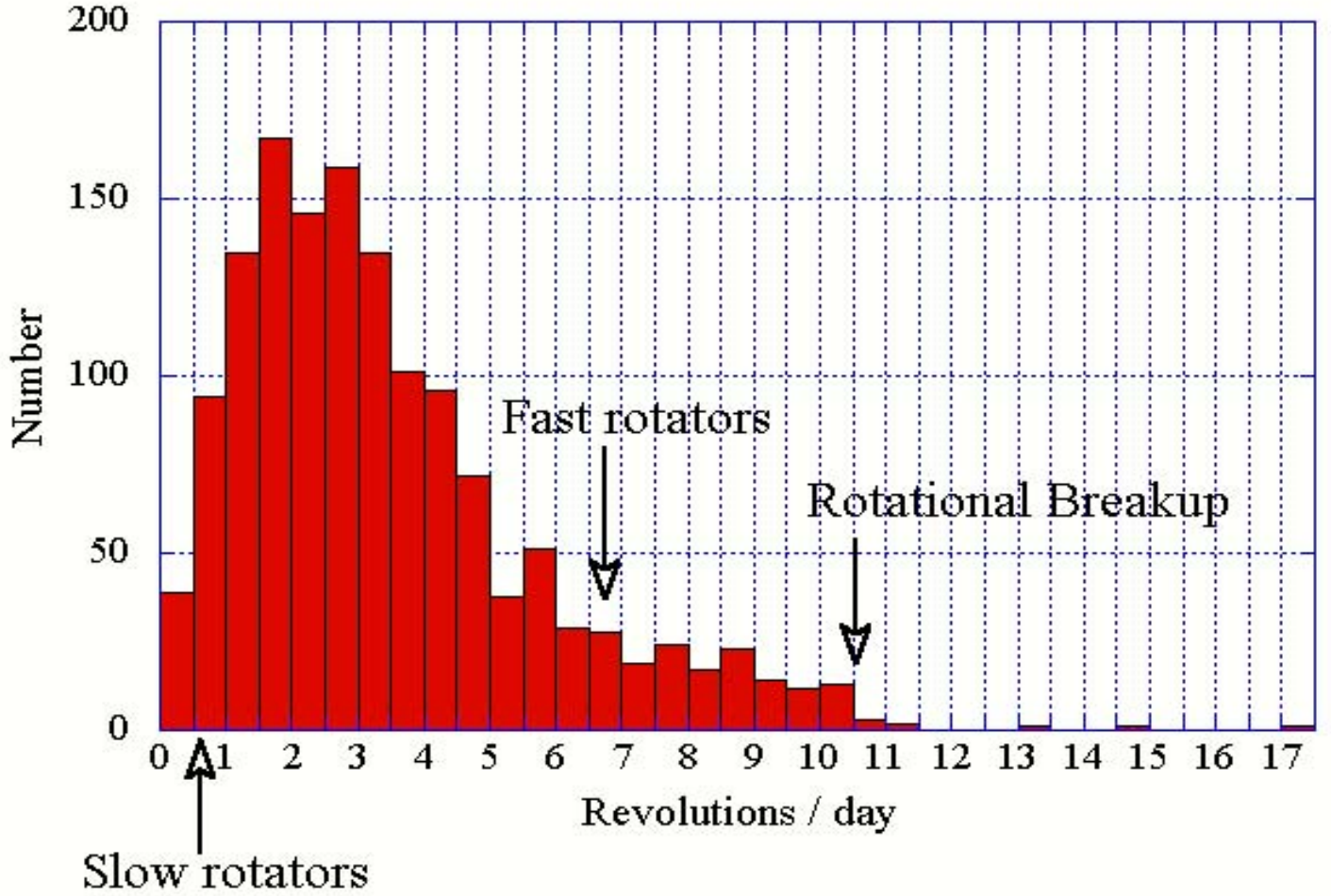
柳澤正久 (電気通信大学)

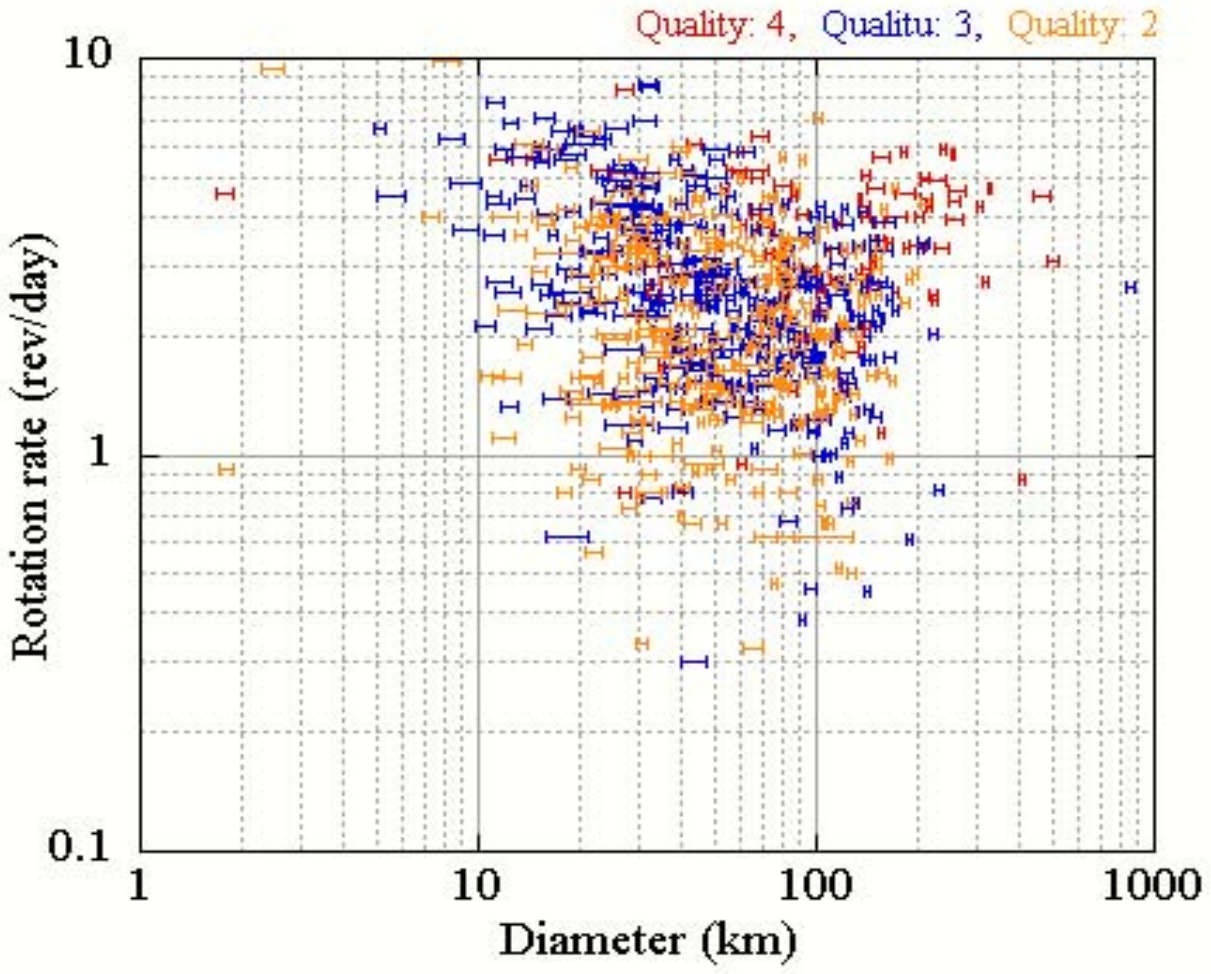


野口 2004


比較星B
比較星E
比較星F
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
19:55
20:55
21:55
22:55
23:55
0:55
1:55
2:55
相対誤差(mag.)
時刻

野口 2004


200
150
100
50
0
Number
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
Revolutions / day
Fast rotators
Rotational Breakup
Slow rotators


Quality: 4, Qualitu: 3, Quality: 2
10
1
0.1
Rotation rate (rev/day)
1
10
100
1000
Diameter (km)

ICARUS 57, 464–476 (1984)

Angular Momentum Drain: A Mechanism for Despinning Asteroids

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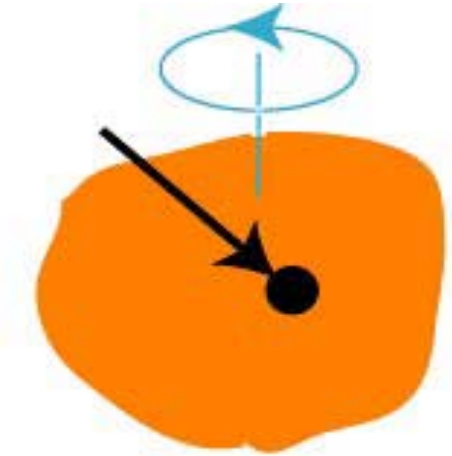
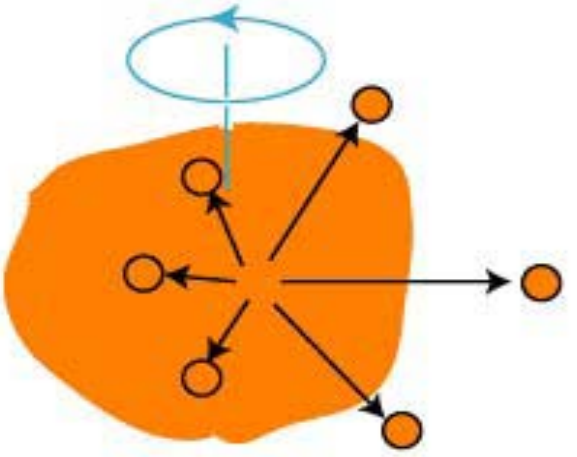
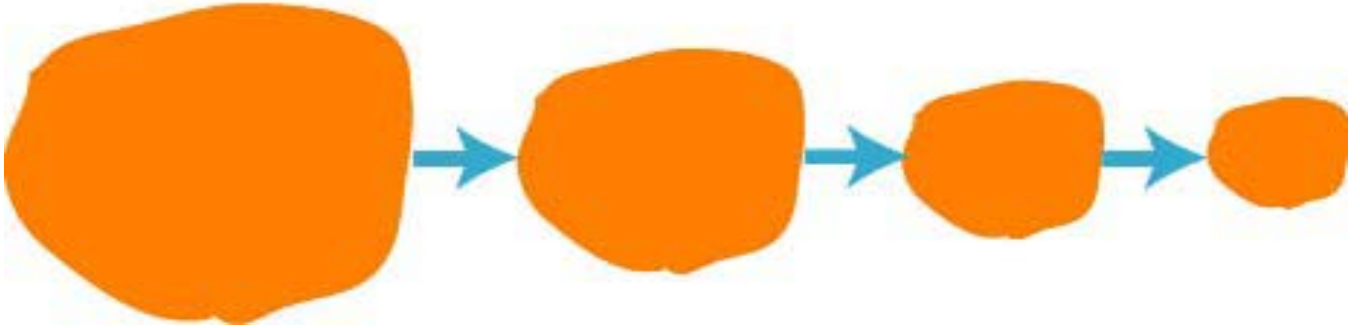
It is proposed that a new mechanism—angular momentum drain—helps account for the relatively slow rotation rates of intermediate-sized asteroids. Impact ejecta on a spinning body preferentially escape in the direction of rotation. This material systematically drains away spin angular momentum, leading to the counterintuitive result that collisions can reduce the spin of midsized objects. For an asteroid of mass M spinning at frequency ω, a mass loss δM corresponds to an average decrease in rotation rate $\delta\omega \approx \omega\delta M/M$. A. W. Harris' (1979, *Icarus* **40**, 145–153) theory for the collisional evolution of asteroidal spins is significantly altered by the inclusion of this effect. While the modified theory is still somewhat artificial, comparison of its predictions with the data of S. F. Dermott, A. W. Harris, and C. D. Murray (1984, *Icarus* **57**, 14–34) suggests that angular momentum drain is essential for understanding the statistics of asteroidal rotations.

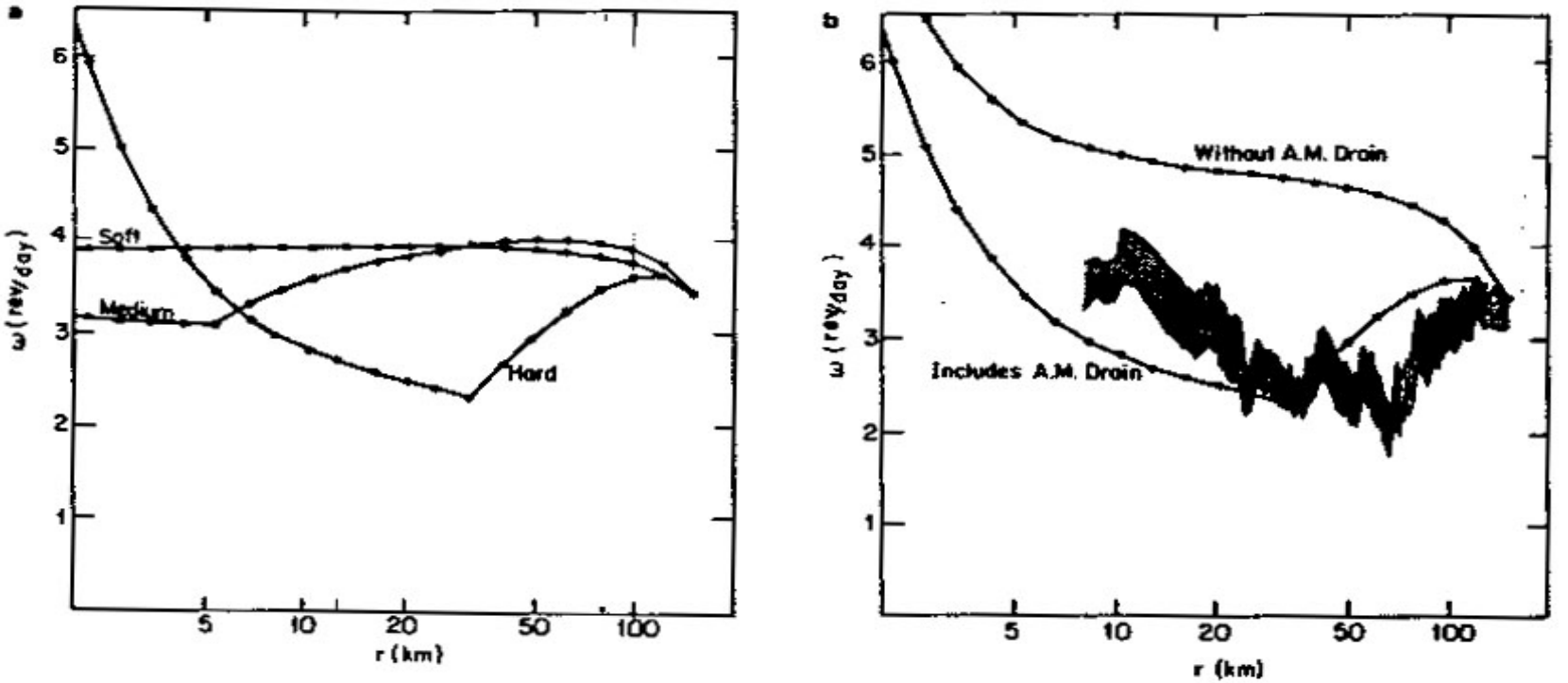


(1) Angular momentum impulse
(2) Mass absorption



(3) Escape of some ejecta
(4) Escaping ejecta drain angular momentum





From Dobrovolskis ans Burns (1984)

今後の課題

1. 小惑星が成長している可能性はないのか?
2. 破壊によってサイズが大きく変化するとき自転に変化はないのか?
3. 最新の衝突のモデルではどうなるか?