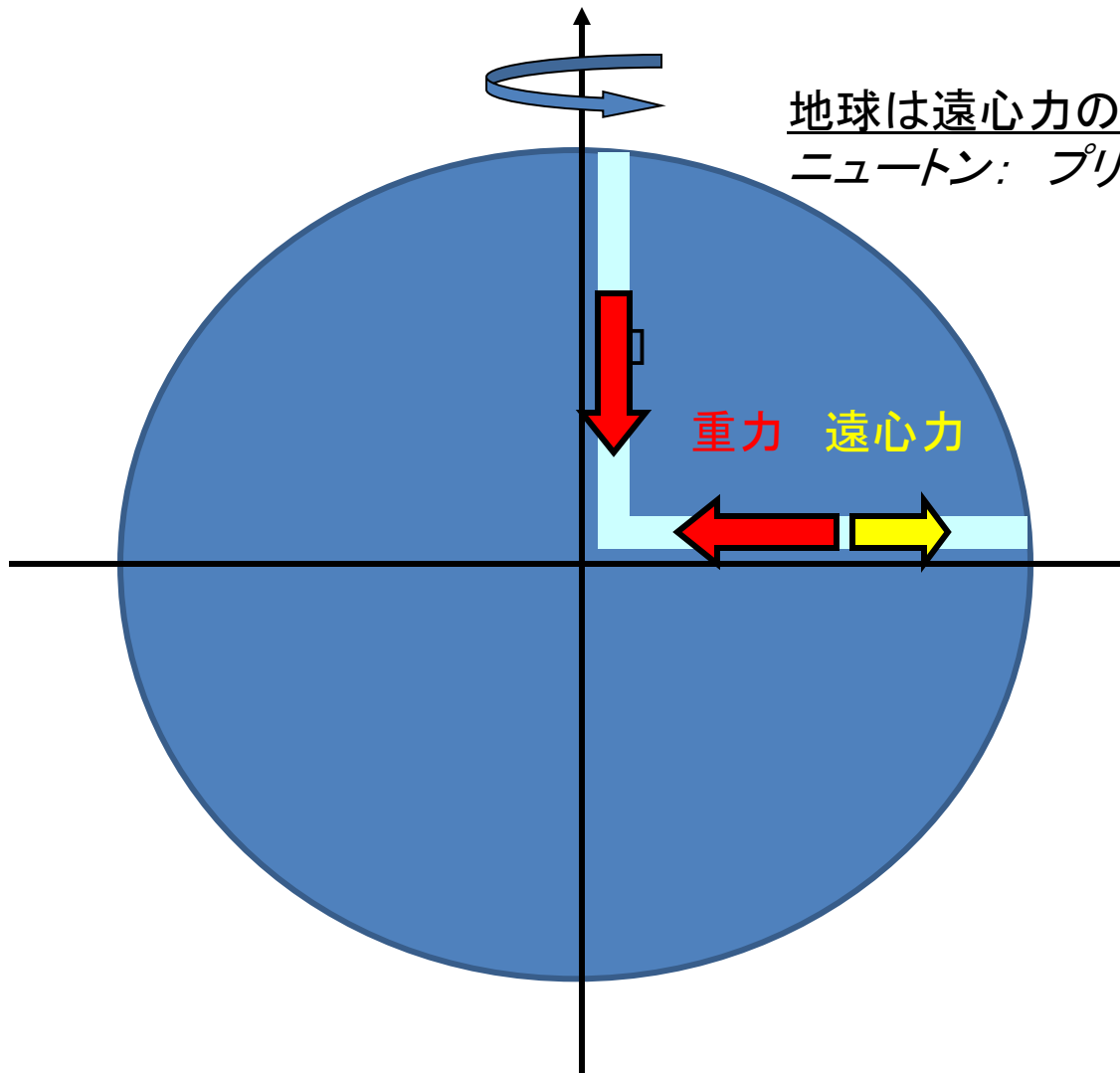


等級振幅の大きい小惑星を
さがしてください

野辺山観測所

高橋 茂

地球の形

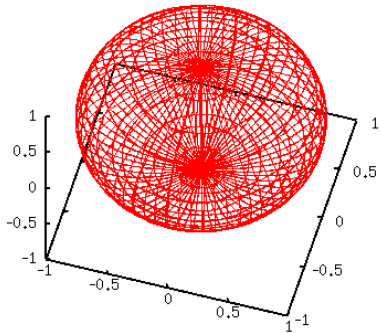


地球は遠心力のため赤道方向にふくらんでいる
ニュートン: プリンキピア

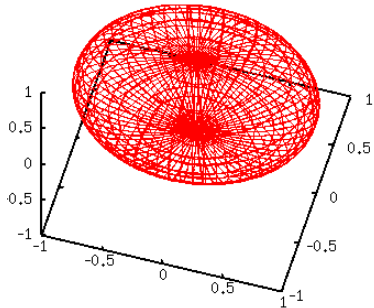
重力 遠心力

平衡形状は
回転角速度 Ω
密度 ρ
で決まる.

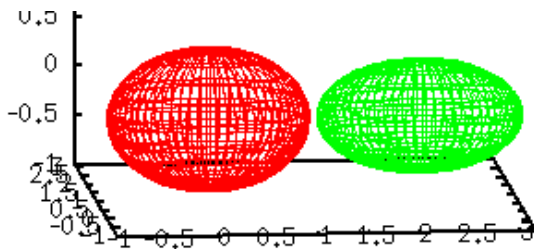
平衡形状



Maclaurin Spheroid
 $a = b > c$



Jacobi Ellipsoid
 $a > b > c$



Roche Binary

小惑星の場合には 1

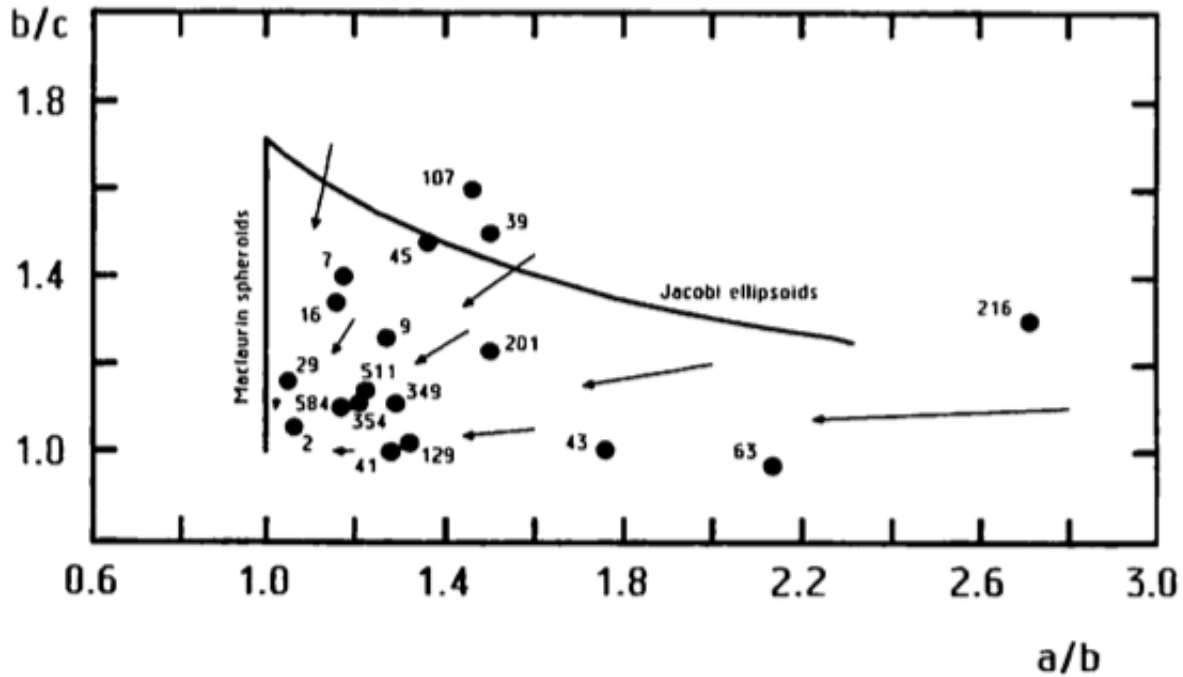
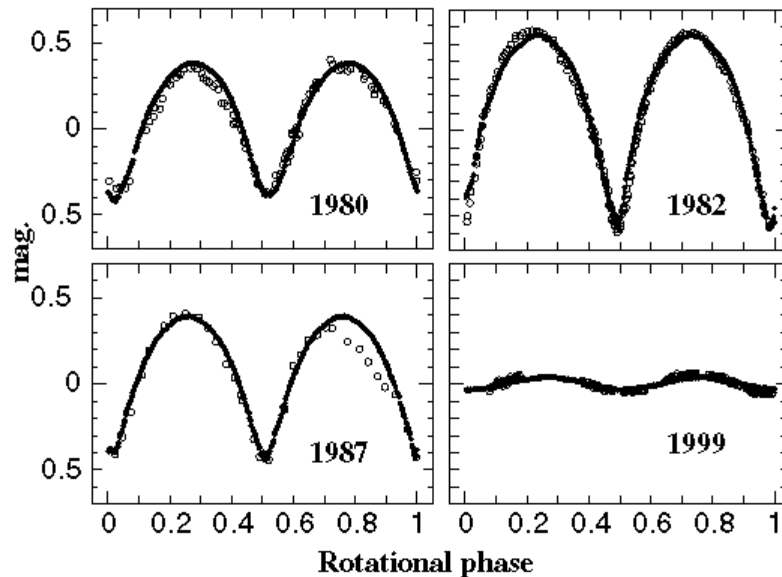


Fig. 10. A homogeneous set of ellipsoidal model parameters (a/b , b/c) for large main-belt asteroids. The loci of Maclaurin spheroids and Jacobi ellipsoids are also shown for comparison (Chandrasekhar 1969). Because of known observational biases, the number of asteroids near the Maclaurin spheroid curve is probably underestimated. Geometric scattering was assumed in the shape determination. The arrows indicate the shift to be applied in order to correct for nongeometric scattering (according to Barucci et al. 1984). The data comes from Magnusson (1986, 1988). See also a similar figure by Drummond et al. (1988b).

(216) Kleopatra



Takahahsi et al. 2004



KBO Varunaと2001QG₂₉₈

- Varuna は Jacobi ellipsoid のモデルがよく合うのではないか？
(Jewitt and Sheppard, AJ, 2002)
- 2001 QG298 の発見
- 等級変動幅が大きい($\Delta 1.2$ mag.)
- Roche バイナリーではないか？
(Sheppard and Jewit, AJ, 2004)
- Rocheバイナリーのモデルシミュレーションを行った。
(Takahashi and Ip, PASJ, 2004)

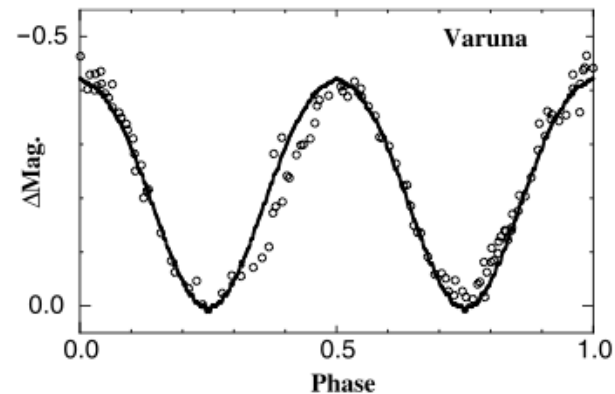
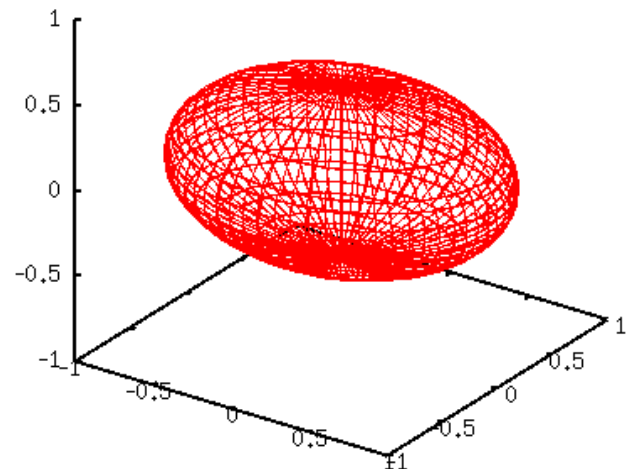


Fig. 4. Lightcurve observations and a simulation of Varuna. The open circles are data by Jewitt and Sheppard (2002), and the thick line is the result of a simulation with the Jacobi ellipsoid ($a = 1.00$, $b = 0.76$, $c = 0.50$). The simulation was done based on an equatorial view with a weight factor of $k = 0.6$.



2001QG₂₉₈のモデルシミュレーション

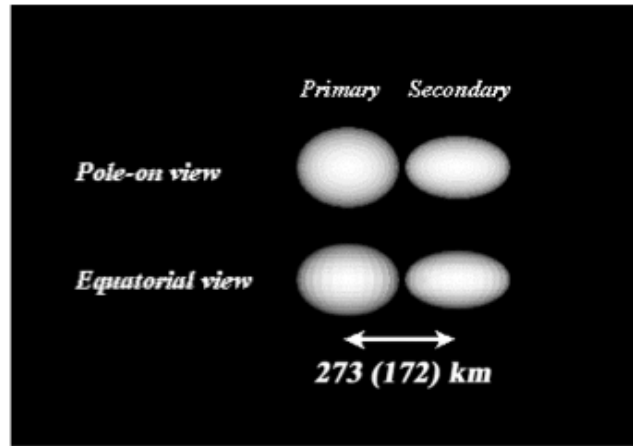
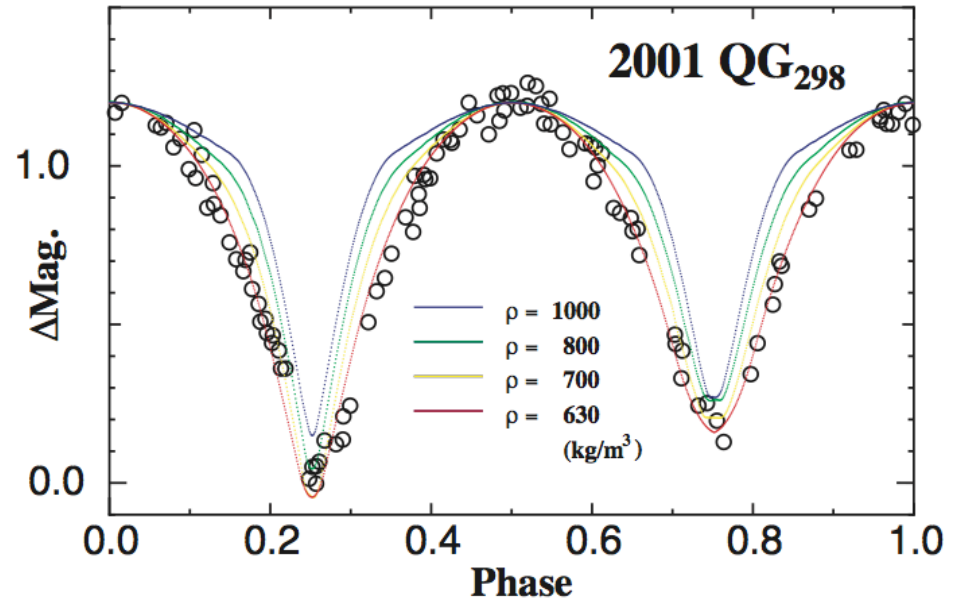


Fig. 3. Best model shape of 2001 QG₂₉₈. At present, the rotation axes, which are parallel to the c and c' axes, would be almost perpendicular to the line of sight from the Earth. If we assume an albedo of 0.04 (0.10), the separation of the two bodies would be ~ 273 (172)km, and the distance between each surface would be ~ 10 (6)km.



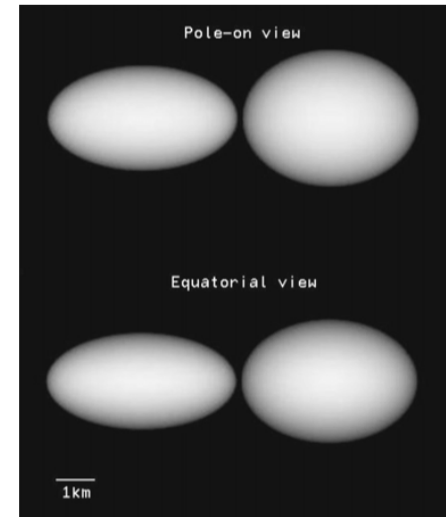
接触型バイナリーは 比較的多く存在する？

•これまでにRoche binary モデルが
ふさわしかった小惑星

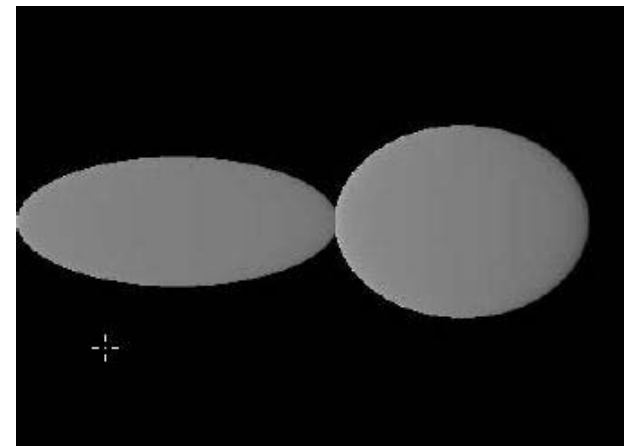
- (3169) Ostro
- (216) Kleopatra
- (624) Hector ?
- (17365)
- (29314)
- 2001QG298

•接触型バイナリー
トロヤ群 6-10 %
(Mann et al. 2007)
KBO 10-20 %
(Sheppard and Jewitt 2004)

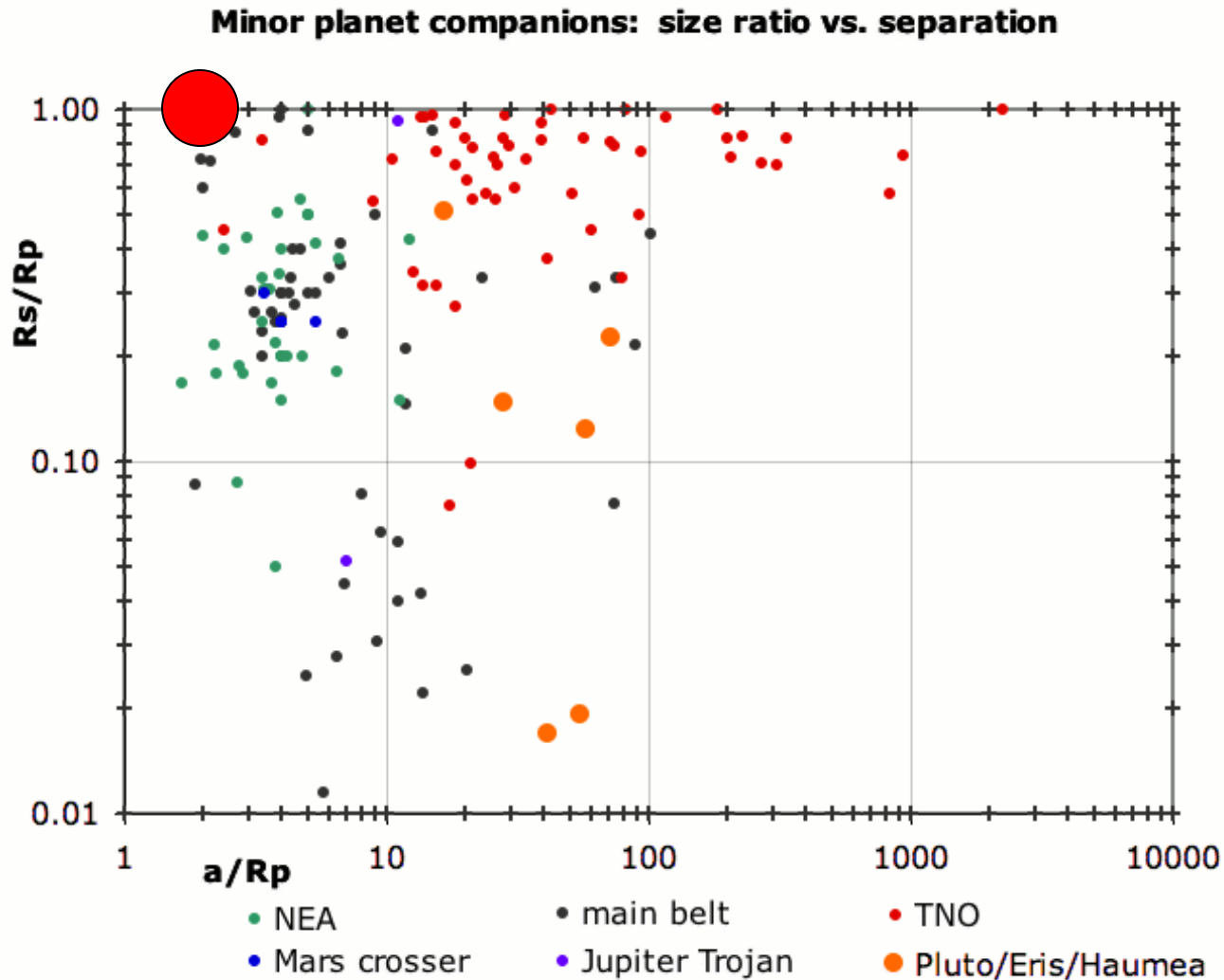
(3169)
Ostro



(17365)



バイナリー天体の半径比と分離比



まとめ

- 小惑星の平衡形状モデルの研究をしています.
(Jacobi ellipsoid, Roche binary)
- 氷天体では、主星と伴星の大きさの比が等しいものが多い
- ライトカーブにおける等級振幅 ($\Delta \geq \sim 0.8\text{mag.}$)
の大きい小惑星を探しています.
- トロヤ群やメインベルト外縁天体は狙い目？
- 見つけたら教えてください.