Relevante Kepler-9 Papers mit PDF-Links

Basierend auf meiner umfassenden Recherche, hier sind alle wichtigen wissenschaftlichen Papers zu KEPLER-9, die Parameter der Körper im System (Masse, Radius und Kepler-Bahnparameter) ermitteln und diskutieren:

Kern-Entdeckungspapiere

1. Holman et al. (2010) - Original Discovery Paper

- **Titel**: "Kepler-9: A System of Multiple Planets Transiting a Sun-Like Star, Confirmed by Timing Variations"
- **Journal**: Science, Vol. 330, Issue 6000, pp. 51-54
- **PDF**: https://www.science.org/cms/asset/c2d40d6b-7086-48ee-8505-f73b6e1e1d90/pap.pdf[1] [2]
- **arXiv**: https://www.science.org/doi/10.1126/science.1195778[3] [4]
- **Beschreibung**: Das erste Paper, das TTVs nutzte um Planeten zu bestätigen und die ersten Massenbestimmungen durchführte

2. Torres et al. (2011) - Kepler-9d Validation

- **Titel**: "Modeling Kepler transit light curves as false positives: Rejection of blend scenarios for Kepler-9, and validation of Kepler-9d"
- **Journal**: Astrophysical Journal, Vol. 727, Article 24
- **arXiv PDF**: https://arxiv.org/pdf/1008.4393.pdf[5] [6]
- **Beschreibung**: BLENDER-Analyse zur Validierung von Kepler-9d als Super-Erde

Stellare Parameter und Planetenzusammensetzung

3. Havel et al. (2011) - Stellare Eigenschaften und Planetenzusammensetzung

- **Titel**: "The multiple planets transiting Kepler-9: I. Inferring stellar properties and planetary compositions"
- **Journal**: Astronomy & Astrophysics, Vol. 531, id.A3
- **arXiv PDF**: https://arxiv.org/pdf/1103.6020.pdf[7] [8]
- **Beschreibung**: Detaillierte Analyse der stellaren Parameter und Planetenzusammensetzung mittels Evolutionsmodellen

Aktualisierte Massen mit vollständigen Kepler-Daten

4. Dreizler & Ofir (2014) - Revidierte Massen

- **Titel**: "Kepler-9 revisited: 60% the mass with six times more data"
- **Journal**: Astronomy & Astrophysics
- **arXiv PDF**: https://arxiv.org/pdf/1403.1372.pdf[9] [1]
- **Beschreibung**: Neubestimmung der Planetenmassen mit vollständigem Kepler-Datensatz, zeigt deutlich geringere Massen

Neueste hochpräzise Messungen

5. Freudenthal et al. (2018) - Photodynamisches Modell

- **Titel**: "Kepler Object of Interest Network II. Photodynamical modelling of Kepler-9 over 8 years of transit observations"
- **Journal**: Astronomy & Astrophysics, Vol. 618, id.A41
- **arXiv**: https://arxiv.org/abs/1807.00007[10]
- **Beschreibung**: Umfassende photodynamische Analyse mit 8 Jahren Beobachtungen und präziseste Dichtemessungen

6. Borsato et al. (2019) - HARPS-N RV Bestätigung

- **Titel**: "HARPS-N radial velocities confirm the low densities of the Kepler-9 planets"
- **Journal**: Monthly Notices of the Royal Astronomical Society, Vol. 484, Issue 3, pp. 3233-3243
- **PDF**: https://orbit.dtu.dk/files/174583391/stz181.pdf[11] [12]
- **Beschreibung**: Bestätigung der geringen Planetendichten durch hochpräzise HARPS-N Radialgeschwindigkeiten

Weitere wichtige Papers

7. Ragozzine & Holman (2019) - Historischer Überblick

- **Titel**: "Kepler-9: the First Multi-Transiting System and the First Transit Timing Variations"
- **arXiv PDF**: https://arxiv.org/pdf/1905.04426.pdf[13] [14]
- **Beschreibung**: Umfassender Überblick über die Entdeckung und Charakterisierung

8. Wang et al. (2017) - Spin-Orbit Alignment

- **Titel**: "Stellar Spin-Orbit Alignment for Kepler-9, a Multi-transiting Planetary System with Two Outer Planets Near 2:1 Resonance"
- **arXiv**: https://arxiv.org/abs/1712.06409[15]
- **Beschreibung**: Rossiter-McLaughlin-Effekt Messungen für Spin-Orbit Ausrichtung

Parameter-Zusammenfassung aus der Literatur

Die wichtigsten physikalischen Parameter aus diesen Studien :[12] [1] [10]

Kepler-9b:

- Masse: 45.1 ± 1.5 M⊕ (aktualisiert) vs. 79.9 ± 6.5 M⊕ (ursprünglich)
- Radius: 11.1 ± 0.1 R⊕
- Dichte: 0.439 ± 0.023 g/cm³ (sehr niedrig)
- Periode: 19.22418 ± 0.00007 Tage

Kepler-9c:

- Masse: 31.0 ± 1.0 M⊕ (aktualisiert) vs. 54.4 ± 4.1 M⊕ (ursprünglich)
- Radius: 10.7 ± 0.1 R⊕
- Dichte: 0.322 ± 0.017 g/cm³ (sehr niedrig)
- Periode: 39.03106 ± 0.0002 Tage

Kepler-9d:

- Masse: ~7 M⊕ (geschätzt)
- Radius: 2.0 ± 0.05 R⊕
- Periode: 1.59295922 ± 0.00000109 Tage

Diese Papers zeigen die Evolution des Verständnisses des Kepler-9 Systems von der ursprünglichen Entdeckung bis zu den neuesten hochpräzisen Messungen, die deutlich geringere Planetendichten ergeben als ursprünglich angenommen.

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1. https://arxiv.org/pdf/1403.1372.pdf
2. https://www.science.org/doi/10.1126/science.1195778
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