論文 / 著書情報
Article / Book Information

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Title(English)	Observational Studies of Young Exoplanets by Multi-Color Photometry
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Category(English)	Doctoral Thesis
種別(和文)	論文要旨
Type(English)	Summary

（博士課程）
Doctoral Program

論 文 要 旨

THESIS SUMMARY

系・コース： Department of, Graduate major in	地球惑星科学　系 コース	申請学位（専攻分野）： Academic Degree Requested	博士 Doctor of　（　理学　）
学生氏名： Student's Name	宮川 浩平	指導教員（主）： Academic Supervisor(main)	佐藤 文衛
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要旨（英文 800 語程度）
Thesis Summary（approx.800 English Words ）

Observational research of young planets has an important role in constructions of the formation and/or evolution processes directly. Especially, cool stars such as M-dwarfs whose effective temperature is approximately 3000 K – 4000 K are focused as feasible targets for study of habitable planets. One problem of young planet research is stellar surface activity which prevents both photometric and spectroscopic observations of the planetary candidates. To solve this problem, this thesis proposes new aspects and methodologies using wavelength dependence of photometric signals from planetary candidates. Chapter 1 suggests the importance of planetary systems around young cools stars and propose current observational problems due to the stellar activity. In Chapter 2, in order to clarify the nature of the stellar activity, photometric variations of the four young M-dwarfs in the Hyades open cluster reported by the K2 mission were investigated with the IRSF 1.4-m telescope. By estimating the wavelength dependences of stellar activity with machine learning based analysis, it was suggested that the signal amplitudes may be suppressed to ~ 30% at the NIR. Relative size and temperature of the starspots in the stellar photosphere were also constrained to be approximately 10% and 0.95, respectively. These results indicate that photometric surveys of planetary candidates at NIR wavelengths are more effective for active M-dwarfs than at visible wavelengths. Chapter 3 performed an intensive injection and recovery test with light curves for cool stars collected by the K2 mission to evaluate the cause of the lack of young systems in the current planetary distribution. Furthermore, tests assuming observations at NIR wavelengths with mock light curves were performed to propose improvement of the detection efficiency at NIR wavelengths for future survey missions. Considering the derived detection biases, current planetary distribution for cool stars possibly has a potential trend with respect to the rotation velocity of the host stars. This trend may be caused by some conditions such as binarity of the host star, whereas more observational evidences are required. The NIR test showed that the detectability is almost doubled around rapidly rotating targets with the period of about 1 d compared to that at visible wavelengths and indicates that mission planetary candidates with age of about 100 Myr may be found in future NIR monitoring photometry. Even if new planetary candidates are detected in future NIR observations, it is difficult to constrain young planetary systems around active stars. Therefore, Chapter 4 presented a new method to assess the properties of transiting planet candidates by multi-color photometry. By analyzing multicolor transit/eclipse light curves and apparent magnitudes of the target in parallel, this method attempts to identify the nature of the system and provide a quantitative constraint on the properties of unresolved companion(s). The method was demonstrated by observing the six systems hosting candidate transiting planets and it is suggested that systematic uncertainties depending on the models and/or using passbands are significantly small. While this algorithm alone is not powerful enough to validate or refute planet candidates, the technique allows us to constrain the properties of resolved/unresolved companions. Results in this thesis will promote future study of young exoplanets around cool stars which is a key to test the theoretical scenarios.

備考 ： 論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。
Note : Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1copy of 800 Words (English).

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