[구ST-05] Type Ibc Supernova Progenitors in Binary Systems: Observational Constraints on the Progenitor Candidate of the Supernova iPTF13bvn

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The progenitors of Type Ibc supernovae (SNe Ibc) have been believed to be massive Wolf-Rayet (WR) stars, formed either through stellar wind mass loss or Roche-lobe outflow in a binary system. But observations indicate that ordinary SNe Ibc have relatively low ejecta masses (~2 Msun), which is not compatible with the WR star scenario for SN Ibc progenitors. On the other hand, helium stars in binary systems which can be produced via mass transfer are also suggested as a possible candidate for SN Ibc progenitors. Binary star evolution models predict that SN Ibc progenitors having final masses of 3-7 Msun can be produced, but their observational properties are not well understood. In this study, we present the parameter study on the observational constraints of helium stars of 3-5 Msun in binary systems using evolutionary models and the atmospheric radiative transfer code CMFGEN. We present the predicted magnitudes and spectra of helium stars in optical bands for different wind velocity profiles and mass loss rates. We also present those observables of the progenitor binary system considering O-type companion stars. Based on the results, we discuss the expected observational properties of SN Ibc progenitors in binary systems. In particular, we discuss the constraints on the progenitor of the SN Ib iPTF13bvn of which progenitor candidate has been identified for the first time in pre-explosion images among SNe Ibc.

[포ST-01] Finding best parameters from color-magnitude diagrams of globular clusters using numerical optimization techniques

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최근 10년 동안의 측광 및 분광관측을 통하여 우리은하 내 구상성단들 중 대부분이 적어도 2개 이상의 항성종족을 갖는다고 밝혀졌다. 현재까지 이루어진 대부분의 구상성단의 항성종족 연구에서는 관측된 색등급도와 항성종족 합성모델 사이에 eye-fitting을 함으로써 항성종족 파라미터, 즉 중원소함량, 나이, 헬륨함량 등을 추정해왔다. 우리는 구상성단의 항성종족을 분석하기 위해 χ^2-Minimization에 의거하여 구상성단과 항성종족 합성모델의 Hess Diagram을 비교하고, 수치계산 기법을 도입하여 최적의 파라미터를 추정하는 알고리즘을 개발하였다. 이 연구에서는 가상으로 만든 성단에 대하여 Recovery Test를 수행함으로써 이 알고리즘의 Self-Consistency를 검증하였고, 실제 관측결과를 사용하여 이 연구의 적용 가능성을 조사하였다.