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Title: Challenges of cm/s Doppler spectroscopy
Type: Invited Talk
Session: Future Exoplanet Telescopes and Instrumentation
Abstract: Only ten years ago the best Doppler measurements were achieving 3 m/s precision. A large fraction of the astronomical community believed that an instrumental limit had been attained, others argued that stellar effects would never allow to obtain better measurements anyway. Today we know that reality is different, fortunately. In fact, without the improvements made to reach sub-m/s precision during the last decade, we would not know about the large population of Neptune-mass and few Earth-mass planets that actually are most frequent around solar-type stars. The combination of KEPLER results on sizes and planet frequency combined with the results delivered by precise Doppler spectroscopy turned out to be critical for the understanding of the formation and the nature of planets and planetary systems.

Can Doppler spectroscopy do even better and what can we expect from cm/s precision? It is commonly accepted that a long-term stability of 50cm/s has been achieved on long term (10 years). On the instrumental side, the measurement precision is today limited by illumination effects and calibration errors, but solutions to these technical problems have already been identified and even demonstrated. On the other hand, it becomes clear that, at the level of 1 m/s, all stars show at least some radial-velocity jitter. The nature of this jitter and whether it can be corrected for is being investigated. The best solution would consist in an a priori correction using observables perfectly correlated with the stellar signal. While searching for such possibilities, it has been demonstrated that stellar jitter can also simply be filtered and the planetary signal recovered if the stellar signal has a very different periodicity compared to the planetary signal.

In my talk I shall try to show where we stand in terms of technical challenges and capabilities, and discuss optimum observing strategies and stellar jitter removal in order to reach (a few) cm/s precision. If this objective is reached it will open the path to the characterization of Earth-like planets.