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Mapping the anisotropic stochastic gravitational-wave background

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As of today, the Advanced LIGO and Virgo gravitational-wave (GW) detectors have cataloged nearly 100 GW detections from various compact object mergers. These discoveries began the endeavors to search for other kinds of GW sources. Among these, the Stochastic Gravitational-Wave Background (SGWB), because of the superposition of individually undetectable cosmological and/or astrophysical sources, is one of the potential sources to observe with the network of ground-based GW observatories in the coming years. A cosmologically produced SGWB would carry unique signatures from the earliest epochs in the evolution of the Universe. Likewise, an astrophysical background would provide information about the astrophysical sources that generated it. To a first approximation, the SGWB is assumed to be isotropic; one could determine its statistical properties by observing any part of the sky. However, these backgrounds can be anisotropic as well. We have developed techniques based on data folding to search for such anisotropies in the SGWB efficiently. With these techniques, we could even perform an extremely efficient search in all directions and frequencies. This led to the first creation of the atlas of SGWB. In this talk, I will explain how one can map the SGWB anisotropy and the new directions one can explore with these tools.

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