What can be Learned from X-ray Spectroscopy Concerning Hot Gas in the Local Bubble and Charge Exchange Processes?

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Partial Answer
Nearly nothing for everything, it all depends on:
Spectral resolution - Can individual features be resolved?
Instrumental group - How many photons can be acquired in a reasonableispersive?
Instrumental energy bands - Is the sampled spectrum covering a useful energy range?
Signal/noise - How much of the sky can reasonably be observed in a useful interval?
Angular resolution - What angular scale can be studied? Can those poorly resolved sources be removed?

What Do We Want To Learn?

- How much of the observed X-ray flux is due to emission, after accounting for the solar wind impact?
- What is the physical state of the plasma in the Local Bubble (or bubble-wind interaction)?
- What is the time evolution of the bubble?
- What are the abundances of the elements?
- What is the cosmological history of the Local Bubble?
- What is the distance of SWCX, or the mass of the dark gas?
**What can be Learned?**

**The LHB**

The Cosmic Background at 10 keV

Considering how little we really know about the emission at 10 keV, high resolution X-ray spectroscopy will tell us a lot which can be determined in no other way.

1) Thermal equilibrium versus net
2) Relative abundances of the plasma
3) Temperature, ionization state, local conditions
4) Is there really a LHB

See many similarities at 3 keV?

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**What can be Learned?**

**SWCX**

Solar Wind Charge Exchange

High resolution X-ray spectroscopy will tell us more about the condition of solar wind.

- Temporal variations provide information concerning the distribution between magmatism, heliospheric, and heliopause emissions (within 300 keV).
- Is there really a LHB?

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**What can be Learned?**

**Geospheric SWCX**

SWCX From Earth's Magnetosphere

DPS Observations, Spectrum of the Birkeland line in sight.

Model SWCX

DPS Data vs. Model SWCX

Not many similarities here either

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**Future continued**

SWCX spectrum for an expected line of sight for an observer located at Earth.

SWCX spectrum provided by David Koons, with updated h, k, and data from Venturi (2015).
**SUMMARY**

- High resolution soft X-ray spectroscopy of diffuse emission can provide a routine time for understanding the relative contributions of the Local Hot Bubble and SWCX.
- What is the LHB if there is one?
- What are the abundances in the LHB?
- What is the ionization level of SWCX?
- Heliospheric vs. geospheric (magnetoheath) SWCX.
- Absorbed at 6 keV by the Loop I, the Galactic Ridge, and suprathermal remnants and superbubbles.
- Dominated at 0.5 keV by the unresolved extragalactic background.

**References**

Carter et al. 2007, [results][1].

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