Introduction: The determination of the O isotopic composition of the solar wind (SW) is the highest priority objective of Genesis [1] and measurements are about to be finalized [2]. To increase the fluence for precise O isotope analyses, SW ions were concentrated on a special target. This concentration process, however, induced severe mass fractionation of the implanted ions, which was first modeled [3] and then quantified by [4, 5] based on Ne isotope measurements along the radial distance of the Au-plated stainless-steel cross, used to mount the “real” concentrator targets onto the baseplate. Accordingly, 22Ne/20Ne monotonically decreases from center to edge, with a maximum fractionation of 3.8% per amu (Fig. 1). The concentration factor monotonically decreases from 50 (center) to 5 (edge). These measurements were performed on all 4 arms of the Au cross and revealed that the entire concentrator target was radially symmetrically irradiated, which excludes any major misalignment of the concentrator assemblage during operation [4]. This is an important finding for O and eventual N isotope measurements, as the restricted concentrator target area does not allow extensive control analyses with these elements directly.

The measured isotopic fractionation, however, is different from that obtained by an ion optical simulation of the concentrator performance [4, 5]. The rough surface of the Au cross was considered as one reason for this difference, as it led to a considerably larger backscatter loss and related isotopic fractionation [4] than predicted by SRIM [6]. The disagreement of measured and simulated data, however, renders it difficult to determine the isotopic fractionation of O in the SiC target through analyses of Ne implanted into the Au cross. Therefore, we decided to directly measure the concentrator-induced Ne isotopic fractionation on the SiC target. These analyses, along with modeled differences in Ne and O trajectories in the concentrator, will be used to obtain the definitive O isotopic composition of the SW.

We present here the objectives of these analyses as well as new results from simulation runs of Ne and O in SiC. We also discuss an implantation experiment of Ne in SiC that was carried out to study backscatter losses and related mass fractionation as a test of the SRIM correction. At conference we will present the Ne isotopic composition and Ne/Ar ratio measured in the concentrator SiC target.

Objectives: (1) We will measure 20Ne/22Ne along a radial traverse in SiC. This will enable us to confirm the models of instrumental mass fractionation as function of the radial position on the concentrator to be applied to O [2] and N isotopic measurements. (2) For some analyses we will include 21Ne in order to unambiguously test that isotopic fractionation induced by the concentrator is mass-dependent as indicated by [7], however, within relatively large uncertainties. (3) The measured concentration factors on Ne, together with the modeled values for O and Ne and the Ne fluence measured in the bulk SW targets, will allow us to determine SW fluxes of O and possibly other elements from fluences measured in the concentrator target. (4) We will analyze the Ne/Ar ratio on a few positions along the traverse. Ne/Ar ratios measured in the Au cross by [7] indicated that Ar might be nearly completely admitted to the concentrator target, in contrast to the originally expected range of elements (mass/charge ratios: 2-3.6 equal masses of 4-28) [3]. If Ar suffered no more than minor losses, this could expand the range of elements that can be analyzed in the concentrator target to include Si, S, P, and Cl.

Experimental: Ne isotopes will be measured at about 10 positions equally spaced along the radius of the SiC target. Gas will be extracted by UV laser ablation and measured with a very sensitive mass spectrometer [8] that allows us to consume only (80×80)μm² per analysis. Expected blank contribution will be ≤1% for all Ne isotopes. The SiC quadrant fits in our conventional sample holder. Analyses will be done in Jan-
2010 at ETH Zurich with a similar procedure as [4, 5]. As this mass spectrometer is not suitable for elements heavier than Ne, Ar (together with He and Ne) will be analyzed in a conventional mass spectrometer on about 5 positions each with a (200×200)μm² raster. Based on measured Ne abundances in the Au cross, expected Ar amounts in SiC range between 8×10⁷ and 4×10⁸ atoms per raster (4×10⁴ μm²). Ar blank contribution is expected to be no more than a few percent, and corrections can be done via 40Ar as 40Ar is not detectable in SW.

**Simulated Ne and O isotope fractionation in SiC:** The models indicate that Ne and O in SiC should be similarly mass-fractionated since they have similar mass/charge ratios, as well as only minor backscatter losses (Fig. 1). The simulations predict an overall maximum isotopic fractionation of 42‰ for δ²²Ne and 51‰ for δ¹⁸O. The fractionations for both elements show a minimum at about 17-20mm radius. Also simulated concentrations factors of Ne and O in SiC are similar. We included in this figure also the measured and simulated Ne isotopic composition as obtained from the Au cross, as both curves reflect the difference between measured data and the models [see above and 4]. In contrast to the simulations, which show a fractionation minimum, the measured data indicate a monotonic isotopic fractionation trend. The new Ne measurements will elucidate whether the pattern of isotopic fractionation suggested by the simulations agrees better in SiC than it does in Au. At this point, it is not clear whether the minimum around 17-20mm predicted by the simulations is a real feature of the SiC target (in contrast to the measured pattern in the rough Au cross) or an artifact due to effects in the concentrator not accounted for in the modeling.

**Artificial implantation of Ne into SiC:** We studied backscatter loss and isotope fractionation of Ne implanted into SiC at different angles of incidence (vertical (0°), 45°, and 55°), to verify whether the implanted Ne abundance (9.74×10¹³ ions/cm²) and the ²⁰Ne/²²Ne (10.27±0.02) of the irradiated DOS (0°) serves as reference in Fig. 2 as backscatter loss of Ne from this light-element target is negligible at these energies. Backscatter loss of Ne vertically implanted into SiC should also be negligible according to SRIM (²⁰Ne: 0.1%, ²⁰Ne/²²Ne fractionation 0.3‰). The slightly lower (1%) Ne concentration in SiC is not significant as uncertainties of the area determination are ~1%. The ²⁰Ne/²²Ne is within 2σ uncertainty identical with the DOS value.

![Fig. 2. ²⁰Ne/²²Ne and ²⁰Ne abundances in SiC irradiated at different angles of incidence as % deviation from DOS-0°-data (dashed lines). Gray dots represent measured, red backscatter-corrected data. Errors (omitted on the measured data) are 1σ-standard deviation of 3-9 measurements.](image)

At larger angles of incidence backscatter loss of ²⁰Ne (4% (45°) and 10% (55°)) and fractionation of the ²⁰Ne/²²Ne ratio increase (0.5% (45°) and 1.1% (55°)) relative to DOS-0°. SRIM-based backscatter correction accurately produces ²⁰Ne/²²Ne ratios within 2σ (45°) and 3σ (55°) error. However, backscatter loss is underestimated for absolute ²⁰Ne abundances, at 45° by 2% and 55° by 6%. In general, SRIM can correct for isotopic fractionation in SiC, even at large angles of incidence, however, it significantly underestimates the absolute Ne loss from the SiC target, a finding in contrast to respective Au data [4].

**Conclusion:** We expect that the noble gas analyses in the SiC concentrator target will allow to determine the instrumental mass fractionation of the concentrator, a necessary quantity to determine the definitive O isotopic composition of the SW.