therefore, analyze abundance of pyroxene in the material of researched surface areas (Fig. 2).

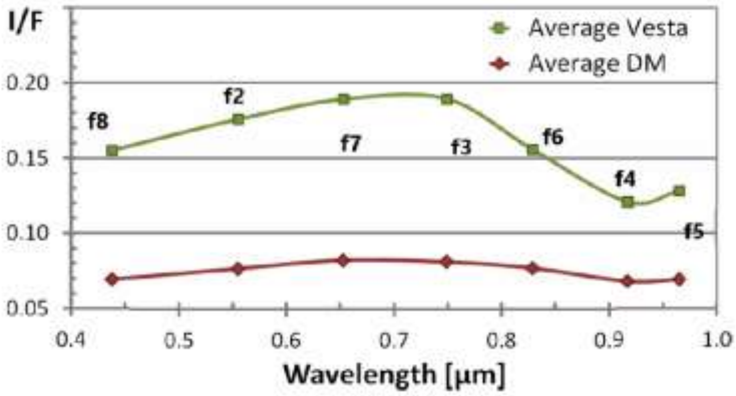

Fig 2. Coverage of the relative reflectance of Vesta and Ceres by FC filter band-passes [3]

There is a plenty of factors that cause observed albedo, color and phase ratio variations: ejecta from young fresh craters, outcrops of bedrocks due to slope processes, such as landslides and taluses, evidences of endogenic activity (cryovolcanism on the Ceres' surface). Searching of such processes of regolith surface layer renovation on Vesta is the main goal with this study.

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ENVIRONMENTAL EFFICIENCY EVALUATION OF A BATTERY ELECTRIC VEHICLE

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Decision makers require accurate and detailed information regarding the life cycle environmental burdens of different passenger transport technologies to efficiently decarbonize the passenger transport sector. Much progress has already been made on this front. Previous studies have already shown that Battery Electric Vehicles(BEV) and Fuel Cell Electric Vehicles (FCEV) can provide climate benefits, though results depend strongly on several factors including the CO2 content of the electricity used for battery charging and hydrogen production, the lifetime distance travelled by the vehicle, and the vehicle’s energy consumption.

Recent studies have also shown that the environmental performance of battery electric vehicles is strongly influenced by the size of the battery, the energy required in the battery production phase, and how that process energy is produced. Thus, future developments in the electricity sector must be included in life cycle background databases in order to more accurately understand the environmental impacts of future battery electric vehicles.

Vehicle energy demand is calculated by assuming that the vehicle follows a fixed velocity versus time profile, and calculating the mechanical energy demand at the wheels required to follow this driving cycle based on parameters for vehicle weight, rolling resistance and aerodynamic properties. Additionally, the energy consumption due to auxiliaries such as heating and cooling, lighting and control functions as well as the potential for recuperative braking are considered where applicable for the specific drivetrain. Finally, the efficiency of all drivetrain components is included in the calculation to determine the tank-to-wheel energy consumption of the vehicle.

The most important component of BEV are the lithium ion batteries used for energy storage, as they are responsible for a significant share of vehicle costs, mass and production impacts. It is assumed that the future battery mass in BEV will decrease compared to current vehicle sand remain constant for PHEV (Plug-in Hybrid Electric Vehicles). However, the energy storage density is expected to improve significantly in the future □ current battery cell energy density is assumed to range from 150 to 250 Wh/kg (most likely value 200 Wh/kg) and with future values ranging from 250 to 500 Wh/kg (most likely value 400 Wh/kg) – resulting in overall increases in energy storage capacity and vehicle range. The specification of the energy storage capacity is an important assumption with strong impact on the results. The rationale behind the best estimate battery size of 55 kWh in 2040 is a substantially expanded charging infrastructure, which will eliminate the current “range anxiety” of drivers, and the positive effect of smaller batteries on vehicle costs and fuel efficiency.

Furthermore, the battery size in PHEV can be hugely variable. PHEV have a rather small battery in the most likely case, but include an upper bound on battery size that reflects a “range extender” type of vehicle configuration. Battery lifetime is a highly uncertain parameter, influenced by the number of charging cycles, calendric ageing, charging power, ambient temperatures, and the battery management system. Broad ranges are therefore used, with current batteries expected to have a lifetime of 100′000-300′000 km (most likely value 200′000 km) after which they are replaced and recycled, in case the vehicle as such lasts longer. Future batteries are expected to have a lifetime distance of 150′000-350′000 km (most likely value 200′000 km). Battery ‘second life’ is indirectly considered: When a vehicle’s battery reaches its end-of-life before the car is retired, the battery is replaced. However, if the car is retired before this replacement battery is expired, the battery is assumed to be used elsewhere, and only the used fraction of the battery is allocated to the car. In short, it is assumed that it is possible to use 1.2 or 2.3 batteries over the lifetime of a BEV, but never less than one complete battery.

Basic cabin thermal energy demand is assumed to be powertrain type independent, though dependent on vehicle class. For example, all lower medium sized vehicles are assumed to have a thermal heating demand of 200–400 W (most likely value 300 W) and a thermal cooling demand of 200–400 W (most likely value 300 W). In the future, the most likely value for these parameters is decreased by 5% and the lower bound is decreased by 10% due to expected improved cabin insulation. However, the actual increased load on engine or battery varies for each powertrain. For example, heat demand for combustion and fuel cell vehicles is supplied using waste heat from the powertrain, and thus poses no additional demand on the engine or fuel cell. Conversely, current BEV use energy directly from the battery to provide heat. Future BEV are assumed to use heat pumps and novel concepts such as localized cabin heating to reduce the power demand on the battery to30–100% (most likely value 80%) of the cabin heat demand. Cooling demands are assumed to be met by an air conditioner with a coefficient of performance between 0.83 and 1.25 (most likely value 1) for all powertrain types, increasing to 1–2 in the future.

The analysis shows that moving from combustion to electric powertrains is likely to reduce the burdens of passenger vehicle travel in most environmental impact categories, it also shows that gains on a similar scale can be made by selecting smaller vehicles and using them more intensely over their lifetimes. In fact, environmental burdens in all impact categories and total ownership costs are quite sensitive to decreasing vehicle mass and increasing vehicle lifetime.

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INNOVATION FROM AMBERSEMI: SILICON CHIP CAPABILITIES FOR PATENTED DIRECT DC AC POWER TECHNOLOGY

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The power electronics industry has taken a significant step forward with the successful launch of the tapeout silicon chip for AmberSemi's patented Direct to