**Supplementary Table 1. Sample description**

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| **Sample** | **Locality** | **Sampling date** | **Stratigraphy** | **Description** |
| NM-1 | Mt. Huashan | 20140910 | overlying | A milk white lamina formed above paintings, fragile. |
| NM-2 | Mt. Huashan | 20140910 | overlying | A thin carbonate layer; red pigment is present on the surface adhered to bed-rock. |
| NM-3 | Mt. Huashan | 20140910 | overlying | A thin carbonate layer; red pigment is present on the surface adhered to bed-rock. |
| NM-4 | Mt. Huashan | 20140910 | underlying | A thick carbonate deposit, it is off-white, loose and porous in the center; red pigment is present on the outside surface. |
| NM-5 | Mt. Huashan | 20140910 | overlying | A thin carbonate layer, red pigment is present on the surface adhered to bed-rock. |
| NM-6 | Mt. Huashan | 20140910 | overlying | An off-white lamina, red pigment is present on the surface adhered to bed-rock. |
| NM-7 | Mt. Huashan | 20140910 | overlying | A thin carbonate layer formed above paintings. |
| NM-8 | Mt. Huashan | 20140910 | underlying | A light yellow carbonate layer, it is thin, loose and porous. |
| NM-9 | Mt. Huashan | 20140910 | overlying | A light yellow carbonate layer, red pigment is present on the surface adhered to bed-rock. |
| NM-10 | Mt. Huashan | 20140910 | underlying | A small piece of carbonate, it is tawny on the outside and light yellow in the center. |
| NM-11 | Mt. Huashan | 20140910 | overlying | A well crystallized carbonate, it is tawny on the outside; red pigment is present on the surface adhered to bed-rock. |
| NM-12 | Mt. Huashan | 20140910 | underlying | A thin carbonate layer, it is loose and porous in the center; red pigment is present on the outside surface. |
| NM-13 | Mt. Huashan | 20140910 | underlying | A granular carbonate, it is brown on the outside and wheat in the center. |
| NM-14 | Mt. Huashan | 20140910 | overlying | A small piece of carbonate, red pigment is present on the surface adhered to bed-rock. |
| NM-15 | Mt. Huashan | 20140910 | underlying | A small piece of carbonate, it is off-white in the center; red pigment is present on the outside surface. |
| NM-16 | Mt. Huashan | 20140910 | overlying | A granular carbonate, it is well crystalized; red pigment is present on the surface adhered to bed-rock. |
| NM-17 | Mt. Huashan | 20140910 | underlying | A milk white lamina formed below paintings, fragile. |
| NM-18 | Mt. Huashan | 20140910 | underlying | A granular carbonate, it is brown on the outside surface and milk white in the center. |
| NM-19 | Mt. Huashan | 20140910 | overlying | A granular carbonate, it is well crystalized; red pigment is present on the surface adhered to bed-rock. |
| NM-20 | Mt. Huashan | 20140910 | overlying | A granular carbonate; red pigment is present on the surface adhered to bed-rock. |
| NM-21 | Mt. Huashan | 20140910 | overlying | A granular carbonate; red pigment is present on the surface adhered to bed-rock. |
| NM-22 | Mt. Huashan | 20140910 | overlying | A thin carbonate layer; red pigment is present on the surface adhered to bed-rock. |
| NM-23 | Mt. Huashan | 20140910 | overlying | A thin carbonate layer, it is loose; red pigment is present on the surface adhered to bed-rock. |
| NM-24 | Mt. Huashan | 20140910 | underlying | A granular carbonate, it is brown on the outside surface and light yellow in the center. |
| NM-25 | Mt. Huashan | 20140910 | overlying | A thin carbonate layer; red pigment is present on the surface adhered to bed-rock. |
| NM-26 | Mt. Huashan | 20140910 | overlying | A small piece of carbonate, it is well crystalized; red pigment is present on the surface adhered to bed-rock. |
| NM-27 | Mt. Huashan | 20140910 | underlying | A granular carbonate, it is brown on the outside surface and light yellow in the center. |
| NM-28 | Mt. Huashan | 20140910 | underlying | A granular carbonate, well crystalized, it is brown on the outside surface and light yellow in the center. |
| NM-29 | Mt. Huashan | 20140910 | underlying | A granular carbonate, well crystalized, it is brown on the outside surface and milk white in the center. |
| NM-30 | Mt. Huashan | 20140913 | overlying | A thin carbonate layer; red pigment is present on the surface adhered to bed-rock. |
| NM-31 | Mt. Huashan | 20140913 | overlying | A thin carbonate layer; red pigment is present on the surface adhered to bed-rock. |
| NM-32 | Mt. Huashan | 20140913 | overlying | A thin carbonate layer; red pigment is present on the surface adhered to bed-rock.。 |
| NM-33 | Mt. Huashan | 20140913 | overlying | A thin carbonate layer; red pigment is present on the surface adhered to bed-rock.。 |
| NM-34 | Mt. Huashan | 20140913 | underlying | A granular carbonate, porous, it is brown on the outside surface and light yellow in the center. |
| NM-35 | Mt. Huashan | 20140913 | underlying | A granular carbonate; the red pigment is present on the outside surface. |
| NM-36 | Mt. Huashan | 20140913 | underlying | A granular carbonate, it is loose and porous in the center; the red pigment is present on the outside surface. |
| NM-37 | Mt. Huashan | 20140913 | overlying | A thin carbonate layer, red pigment is present on the surface adhered to bed-rock. |
| NM-38 | Mt. Huashan | 20140913 | underlying | A granular carbonate; the red pigment is present on the outside surface. |
| NM-39 | Mt. Huashan | 20140913 | overlying | A thin carbonate layer; red pigment is present on the surface adhered to bed-rock. |
| NM-40 | Mt. Huashan | 20140913 | underlying | A granular carbonate; the red pigment is present on the outside surface. |