Supplementary Material

Three-dimensional numerical results on the saturation contours $(\sigma_n = S_n \phi)$ of a three-phase immiscible fluid flow (water + gasoline + air), dry unsaturated zone

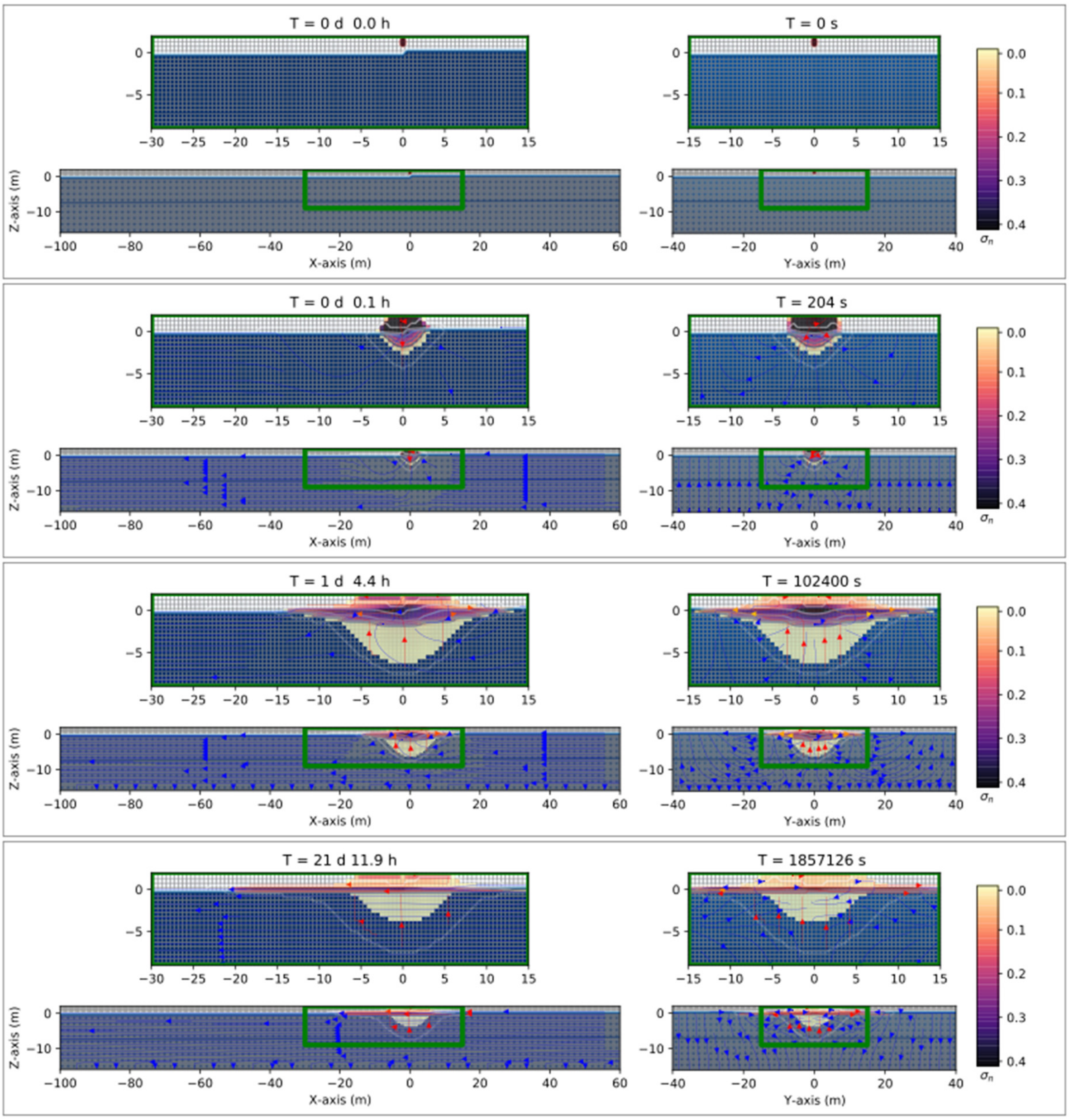

Figure S1. Three-dimensional numerical results on the saturation contours $(\sigma_n = S_n \phi)$ of a three-phase immiscible fluid flow (water + gasoline + air) in a dry soil using a spatial grid resolution of 0.50 m and a grid dimension of $160\,m \times 80\,m \times 18\,m$, at different times. A hydraulic gradient of 0.004. The spill is released from an oil pipeline at $(x, y, z) = (0,0,1)\,m$.

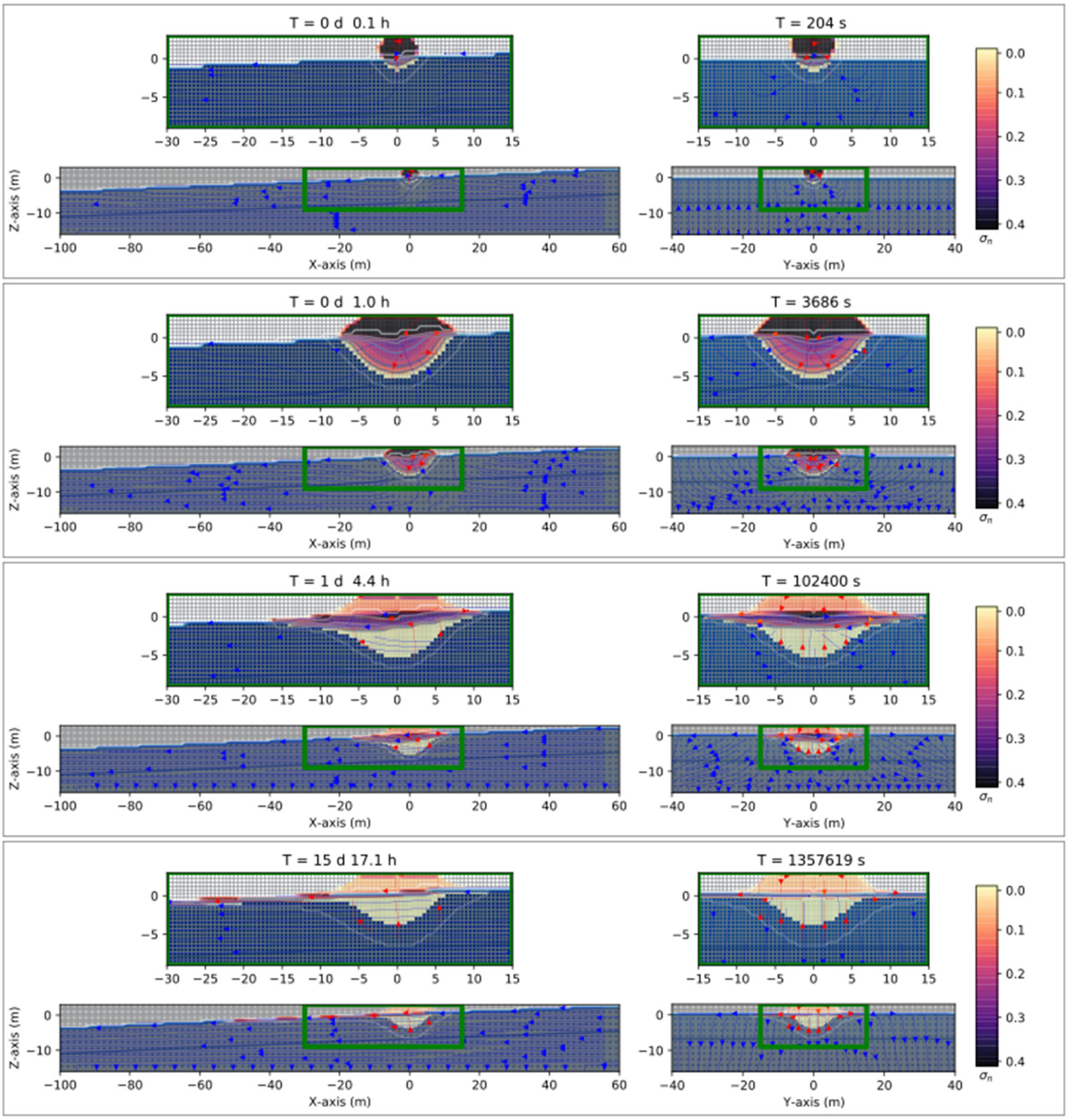

Figure S2. Three-dimensional numerical results on the saturation contours ($\sigma_n = S_n\phi$) of a three-phase immiscible fluid flow (water + gasoline + air) in a dry soil using a spatial grid resolution of 0.50 *m* and a grid dimension of $160\,m \times 80\,m \times 19\,m$, at different times. A hydraulic gradient of 0.04. The spill is released from an oil pipeline at $(x, y, z) = (0,0,2)\ m$.

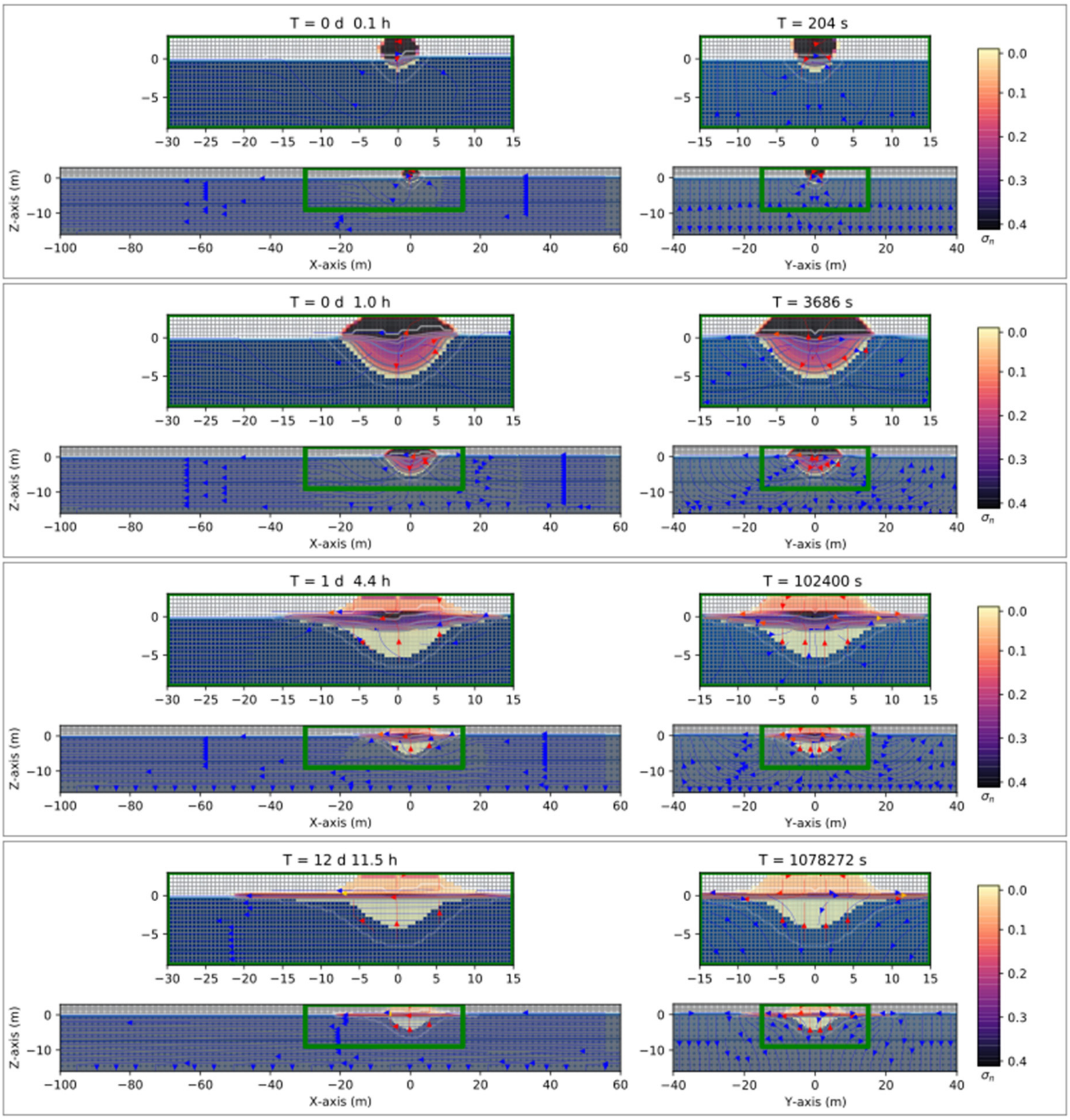

Figure S3. Three-dimensional numerical results on the saturation contours ($\sigma_n = S_n\phi$) of a three-phase immiscible fluid flow (water + gasoline + air) in a dry soil using a spatial grid resolution of 0.50 *m* and a grid dimension of 160 *m* × 80 *m* × 19 *m*, at different times. A hydraulic gradient of 0.004. The spill is released from an oil pipeline at $(x, y, z) = (0,0,2)\ m$.

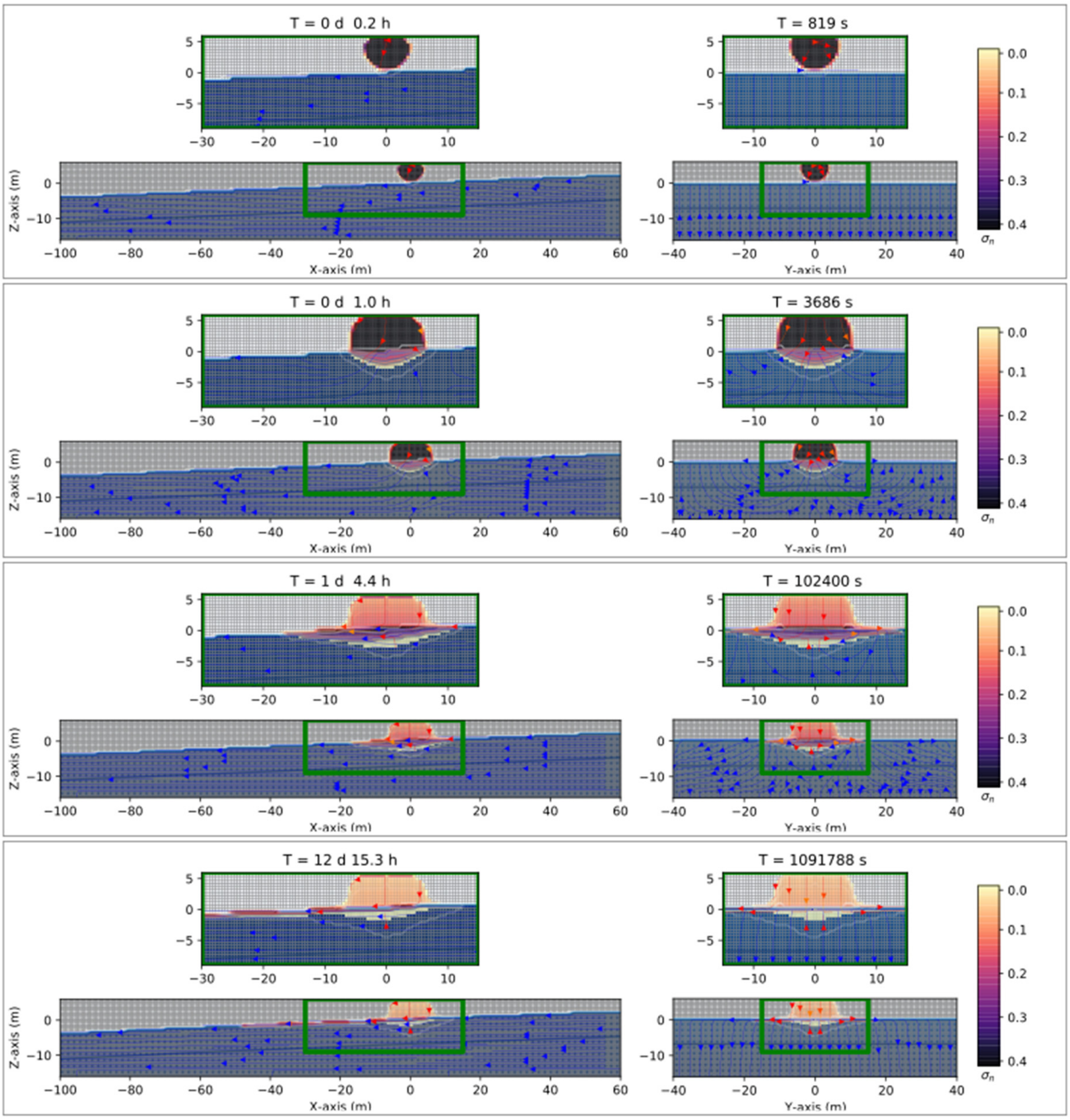

Figure S4. Three-dimensional numerical results on the saturation contours ($\sigma_n = S_n\phi$) of a three-phase immiscible fluid flow (water + gasoline + air) in a dry soil using a spatial grid resolution of 0.50 *m* and a grid dimension of 160 *m* × 80 *m* × 21 *m*, at different times. A hydraulic gradient of 0.04. The spill is released from an oil pipeline at $(x, y, z) = (0,0,5)\ m$.

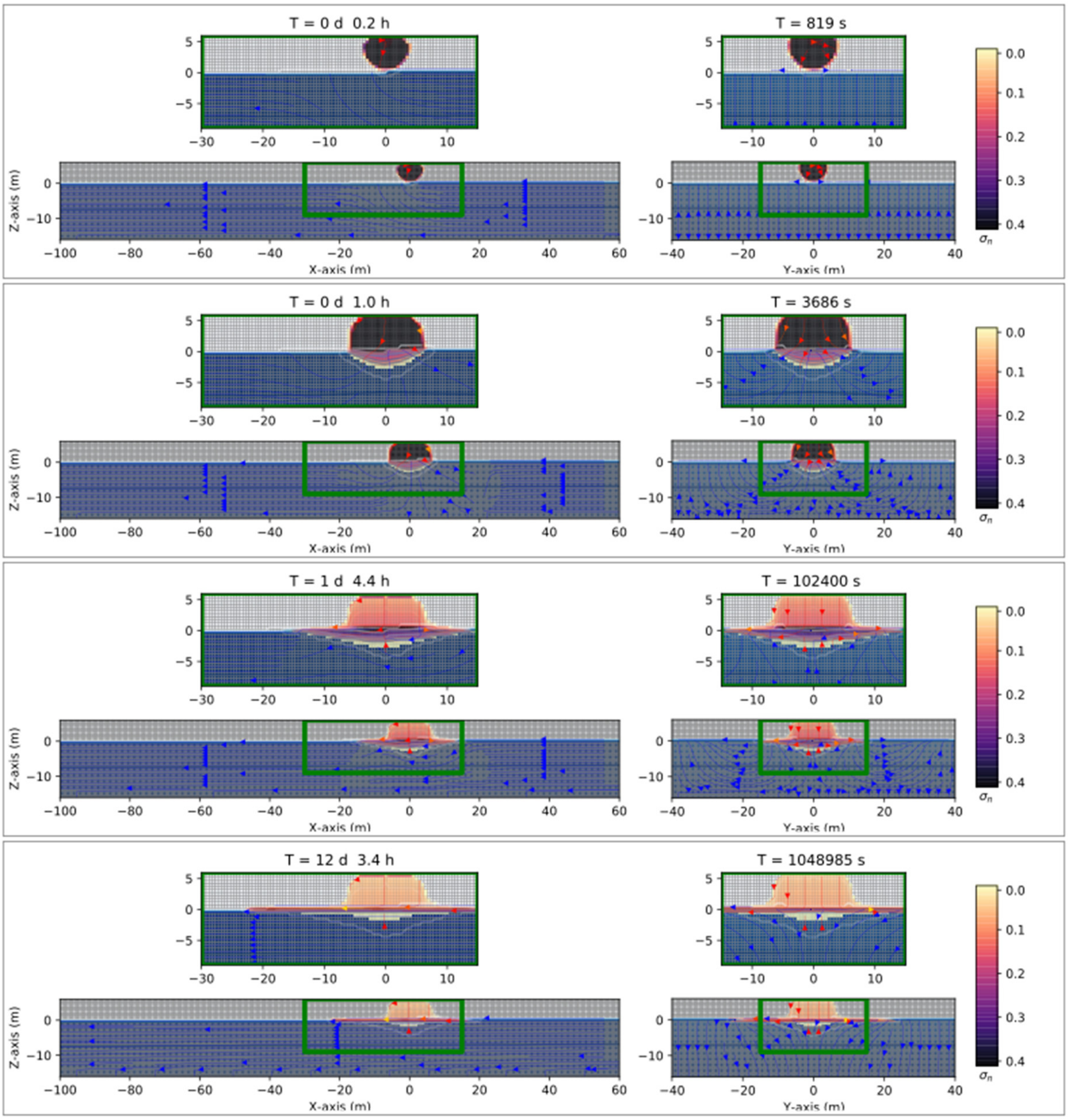

Figure S5. Three-dimensional numerical results on the saturation contours ($\sigma_n = S_n \phi$) of a three-phase immiscible fluid flow (water + gasoline + air) in a dry soil using a spatial grid resolution of 0.50 *m* and a grid dimension of 160 *m* × 80 *m* × 21 *m*, at different times. A hydraulic gradient of 0.004. The spill is released from an oil pipeline at $(x, y, z) = (0,0,5)\ m$.

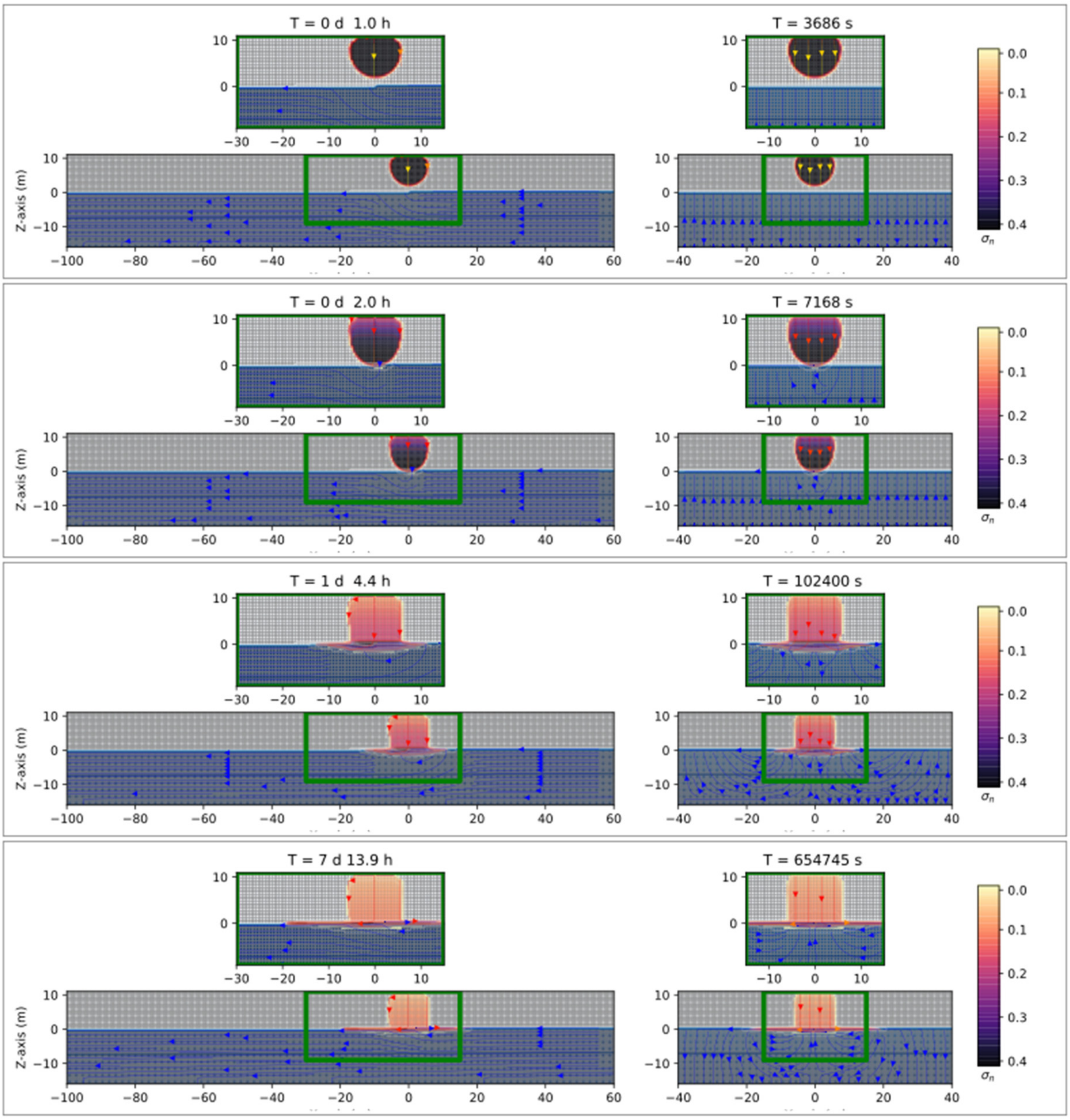

Figure S6. Three-dimensional numerical results on the saturation contours ($\sigma_n = S_n \phi$) of a three-phase immiscible fluid flow (water + gasoline + air) in a dry soil using a spatial grid resolution of 0.50 *m* and a grid dimension of 160 *m* × 80 *m* × 27 *m*, at different times. A hydraulic gradient of 0.004. The spill is released from an oil pipeline at $(x, y, z) = (0,0,10)\ m$.

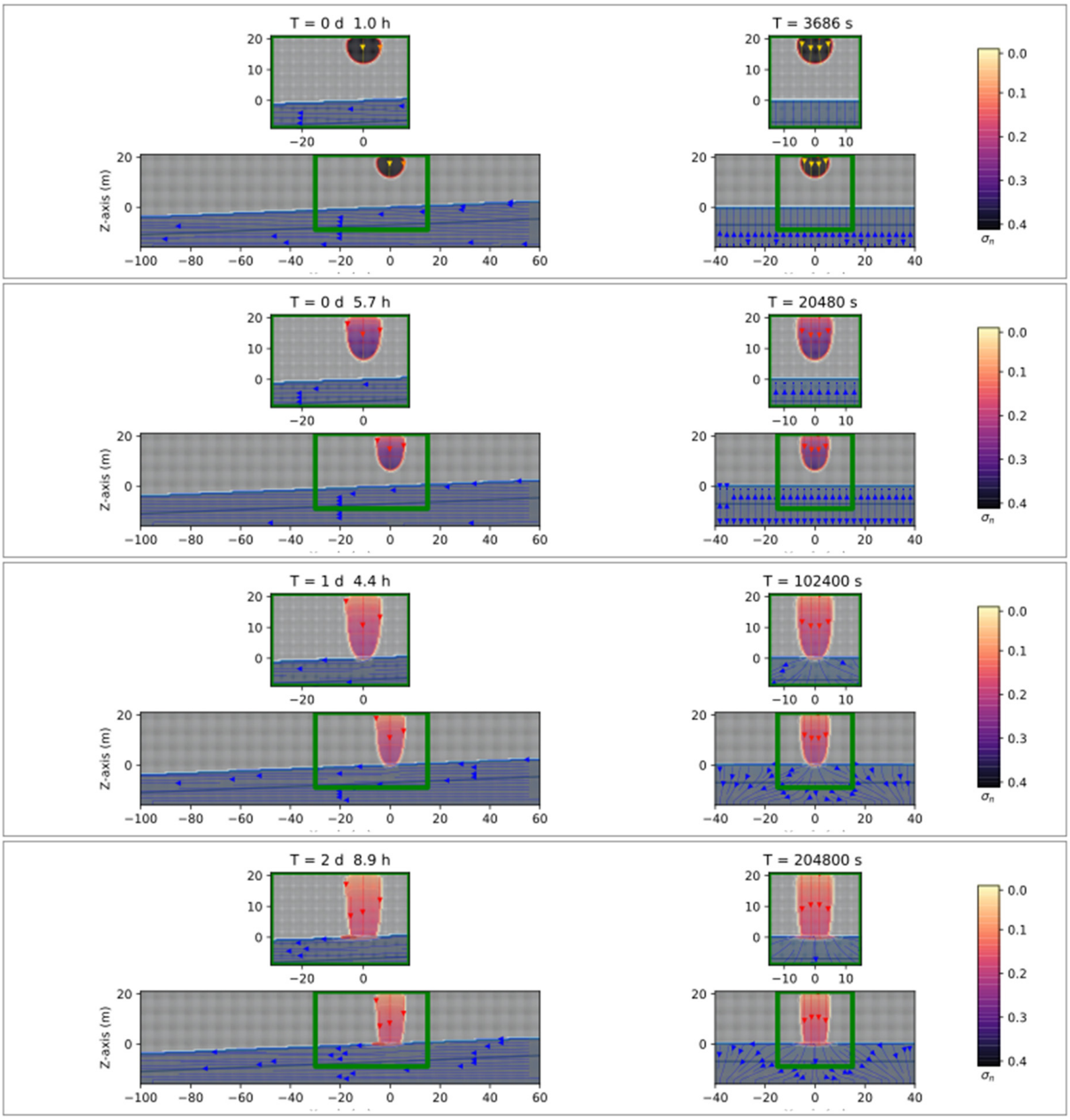

Figure S7. Three-dimensional numerical results on the saturation contours ($\sigma_n = S_n\phi$) of a three-phase immiscible fluid flow (water + gasoline + air) in a dry soil using a spatial grid resolution of 0.50 *m* and a grid dimension of 160 *m* × 80 *m* × 37 *m*, at different times. A hydraulic gradient of 0.04. The spill is released from an oil pipeline at $(x, y, z) = (0,0,20)\ m$.

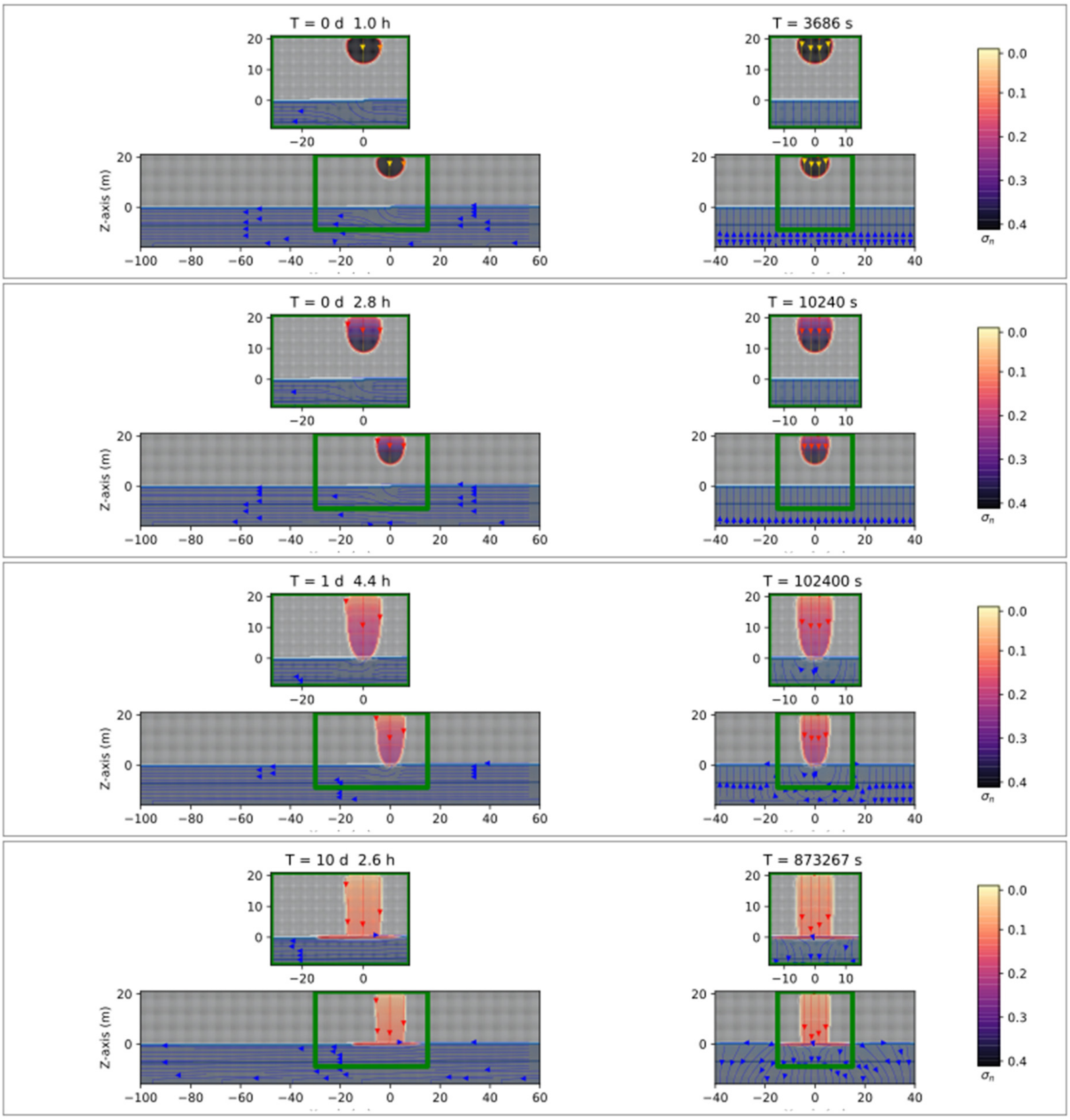

Figure S8. Three-dimensional numerical results on the saturation contours ($\sigma_n = S_n\phi$) of a three-phase immiscible fluid flow (water + gasoline + air) in a dry soil using a spatial grid resolution of 0.50 *m* and a grid dimension of 160 *m* × 80 *m* × 37 *m*, at different times. A hydraulic gradient of 0.004. The spill is released from an oil pipeline at $(x, y, z) = (0,0,20)\ m$.

Three-dimensional numerical results on the saturation contours ($\sigma_n = S_n\phi$) of a three-phase immiscible fluid flow (water + diesel oil + air), dry unsaturated zone

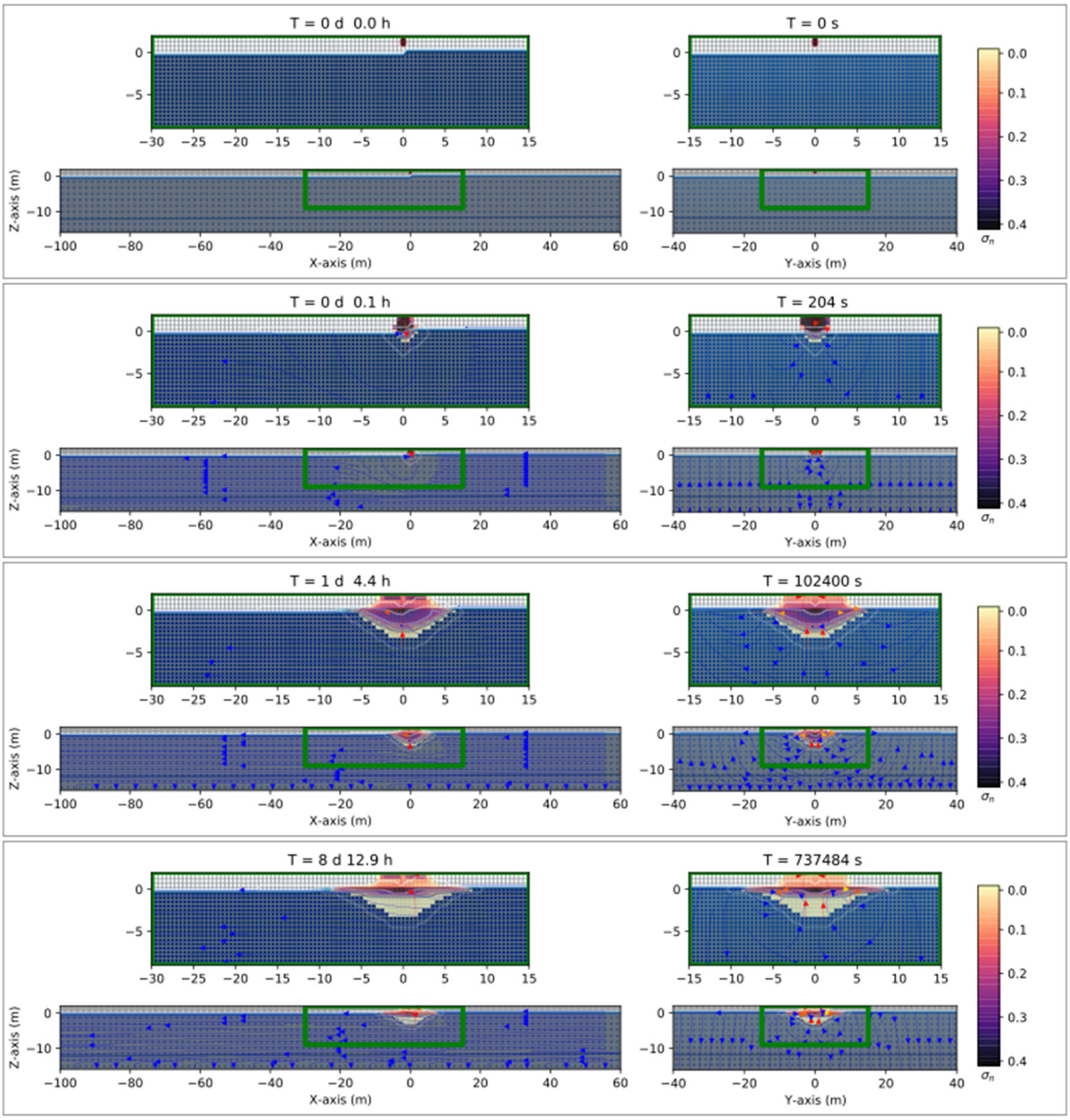

Figure S9. Three-dimensional numerical results on the saturation contours ($\sigma_n = S_n\phi$) of a three-phase immiscible fluid flow (water + diesel oil + air) in a dry soil using a spatial grid resolution of 0.50 *m* and a grid dimension of 160 *m* × 80 *m* × 18 *m*, at different times. A hydraulic gradient of 0.004. The spill is released from an oil pipeline at $(x, y, z) = (0,0,1)\ m$.

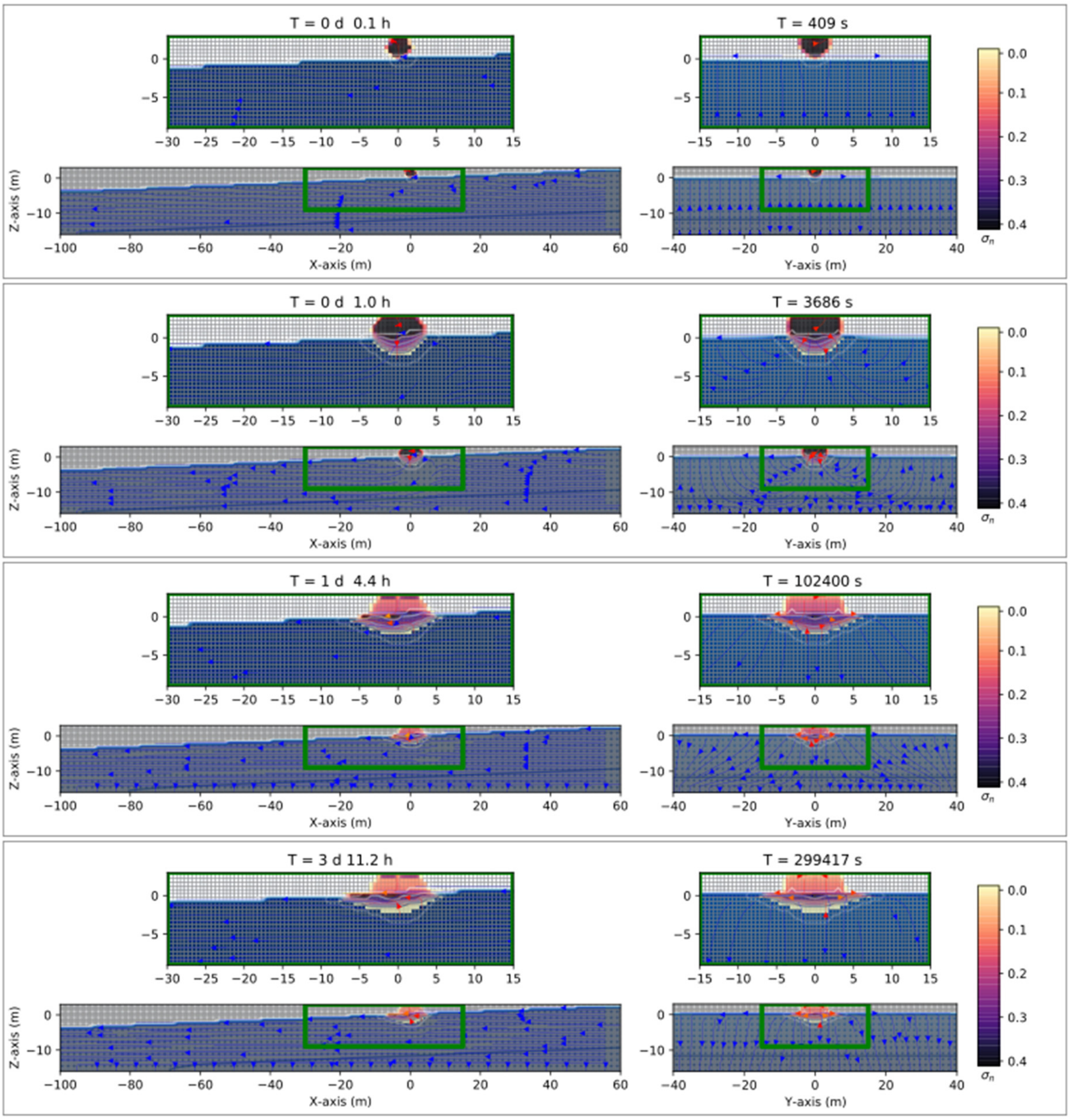

Figure S10. Three-dimensional numerical results on the saturation contours ($\sigma_n = S_n\phi$) of a three-phase immiscible fluid flow (water + diesel oil + air) in a dry soil using a spatial grid resolution of 0.50 *m* and a grid dimension of 160 *m* × 80 *m* × 19 *m*, at different times. A hydraulic gradient of 0.04. The spill is released from an oil pipeline at $(x, y, z) = (0,0,2)\ m$.

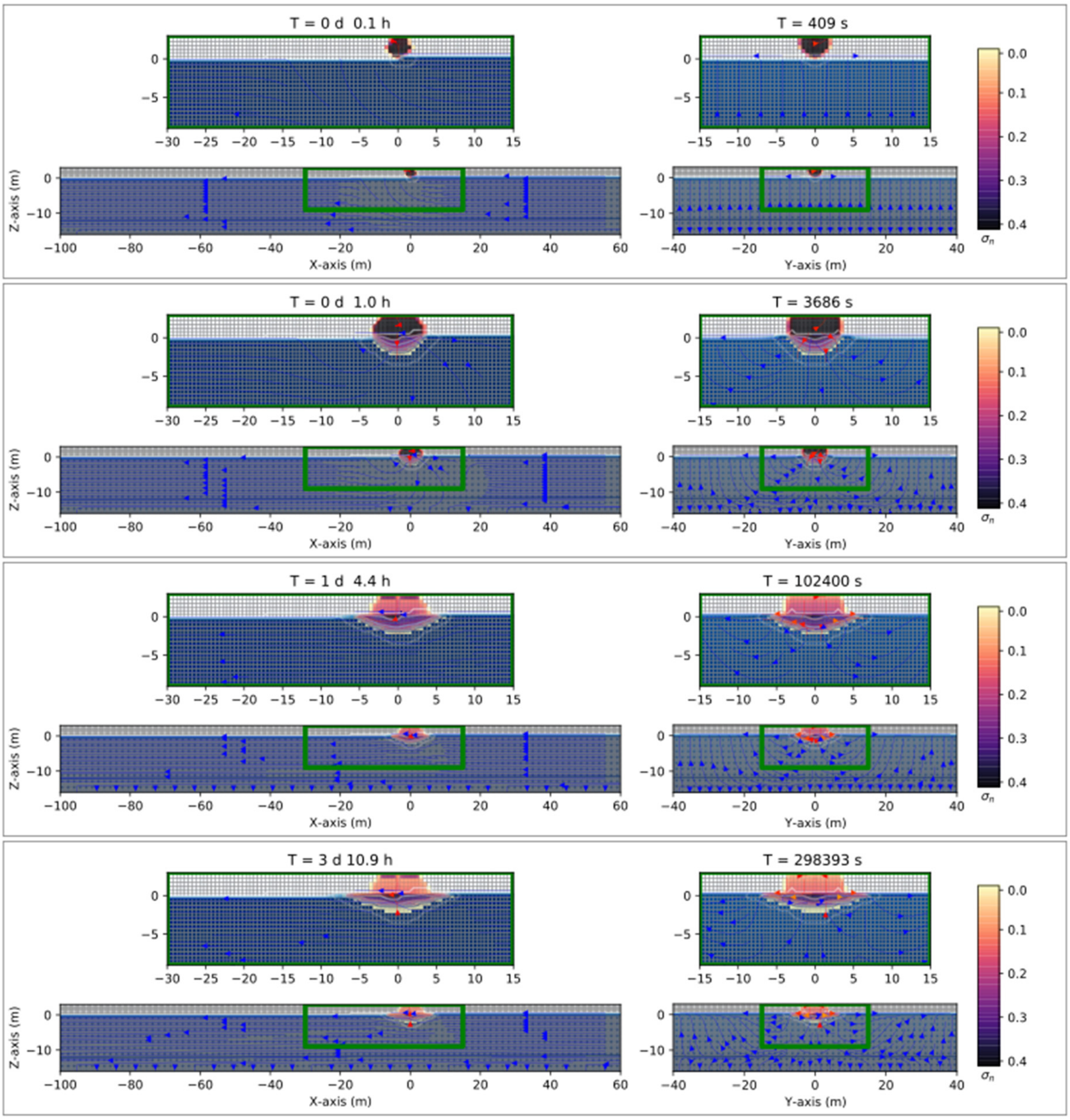

Figure S11. Three-dimensional numerical results on the saturation contours ($\sigma_n = S_n \phi$) of a three-phase immiscible fluid flow (water + diesel oil + air) in a dry soil using a spatial grid resolution of 0.50 *m* and a grid dimension of 160 *m* × 80 *m* × 19 *m*, at different times. A hydraulic gradient of 0.004. The spill is released from an oil pipeline at $(x, y, z) = (0,0,2)\ m$.

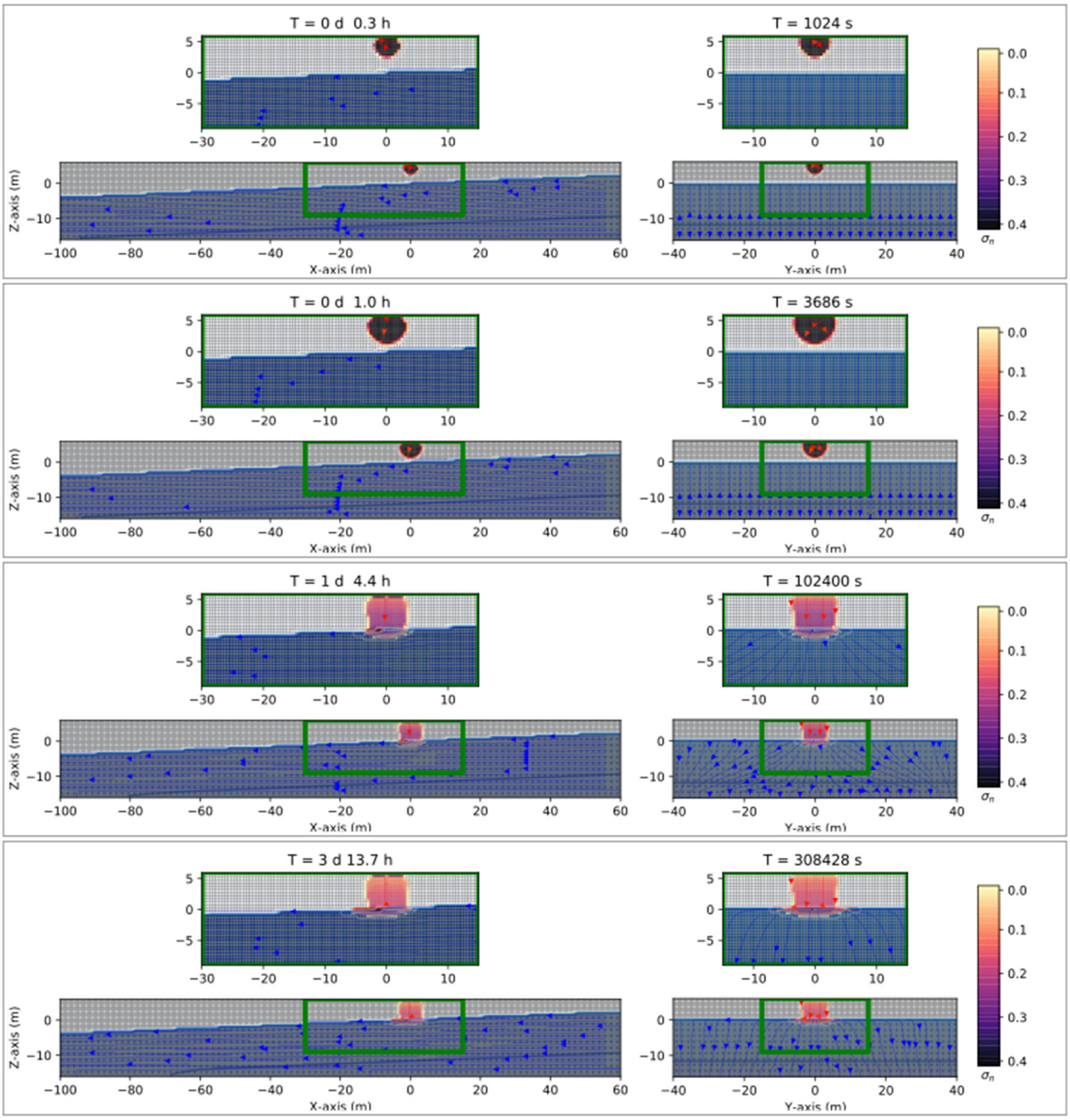

Figure S12. Three-dimensional numerical results on the saturation contours ($\sigma_n = S_n\phi$) of a three-phase immiscible fluid flow (water + diesel oil + air) in a dry soil using a spatial grid resolution of 0.50 *m* and a grid dimension of 160 *m* × 80 *m* × 22 *m*, at different times. A hydraulic gradient of 0.04. The spill is released from an oil pipeline at $(x, y, z) = (0,0,5)\ m$.

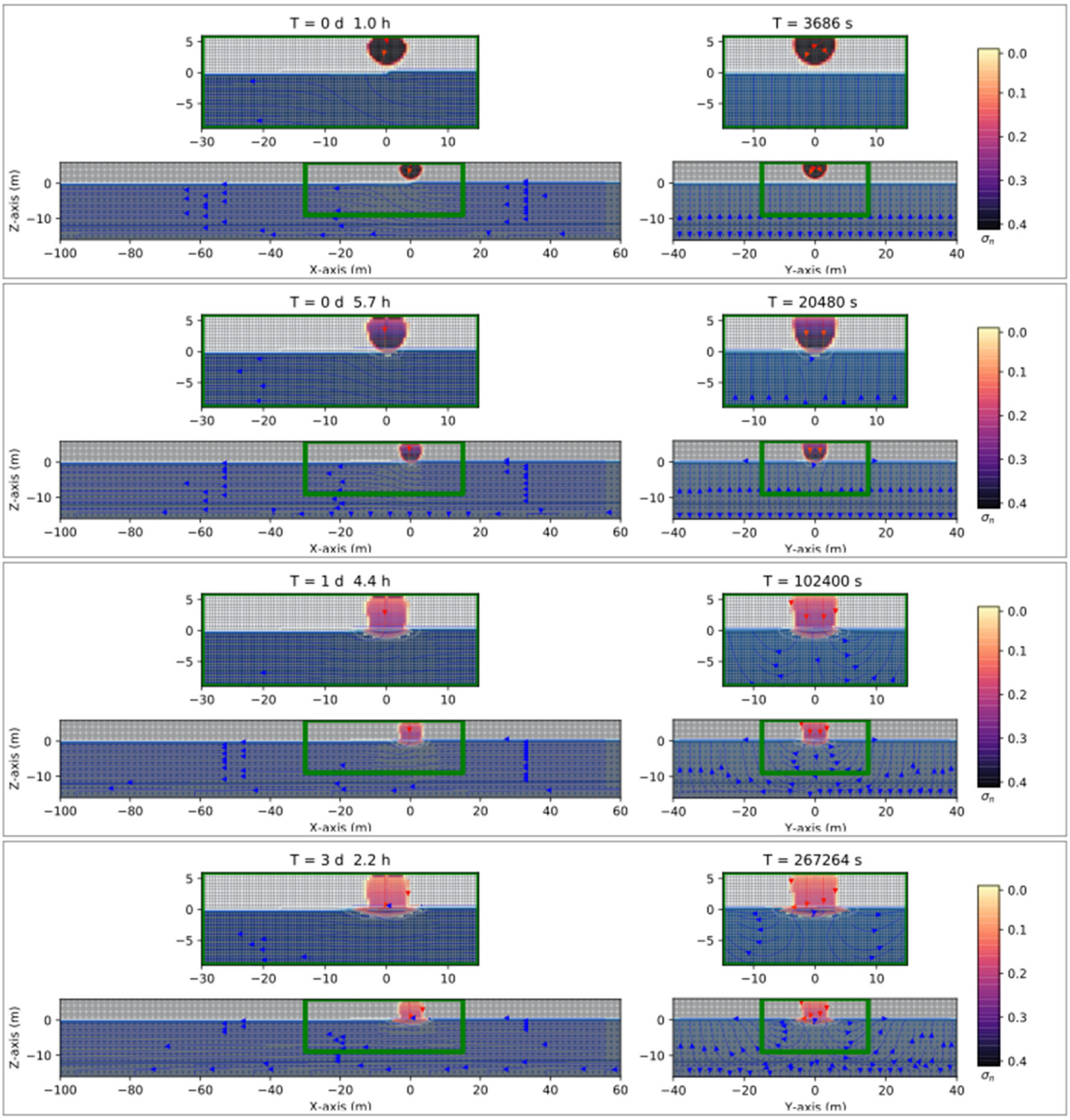

Figure S13. Three-dimensional numerical results on the saturation contours $(\sigma_n = S_n\phi)$ of a three-phase immiscible fluid flow (water + diesel oil + air) in a dry soil using a spatial grid resolution of 0.50 *m* and a grid dimension of 160 *m* × 80 *m* × 22 *m*, at different times. A hydraulic gradient of 0.004. The spill is released from an oil pipeline at $(x, y, z) = (0,0,5)\ m$.

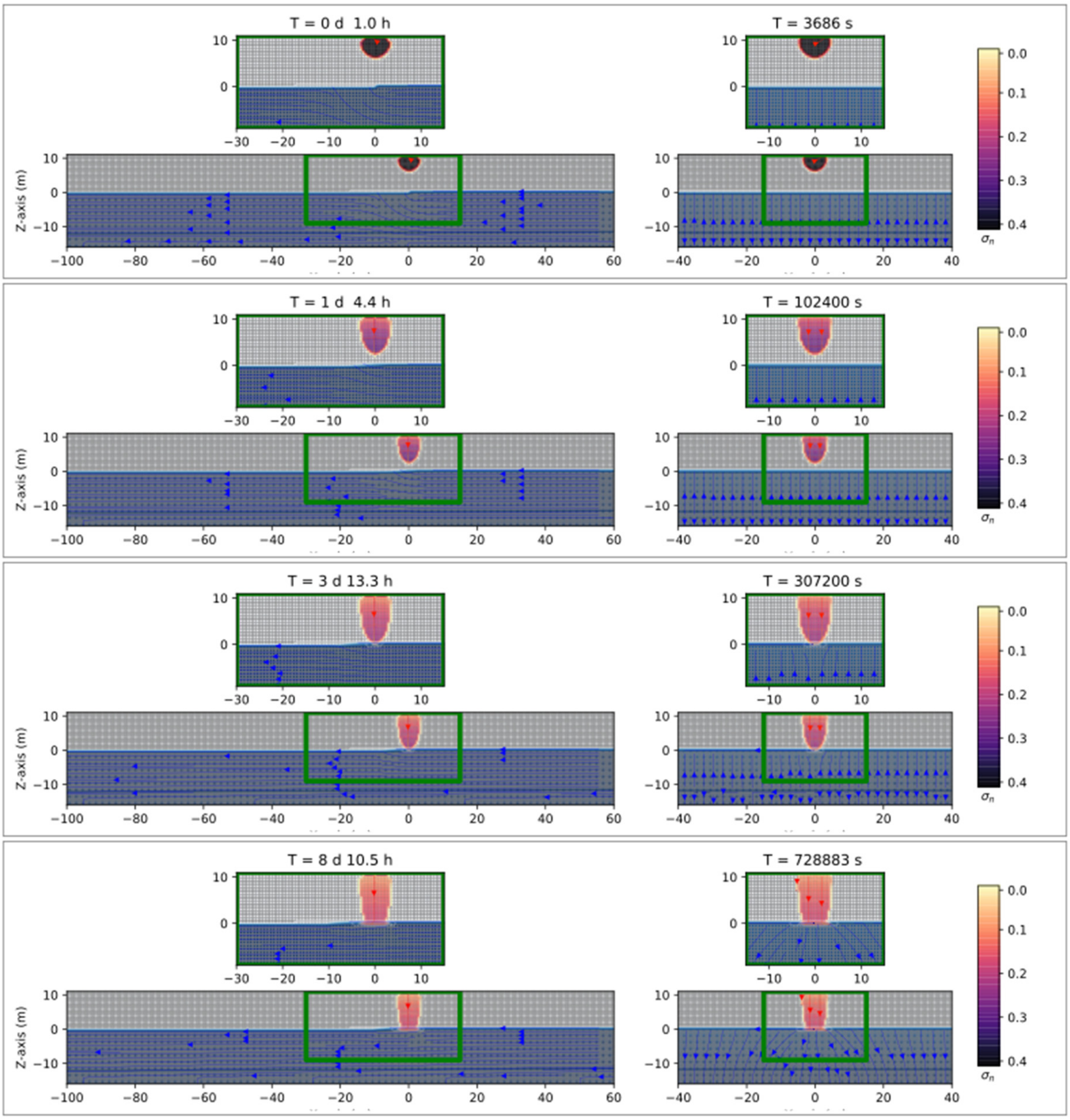

Figure S14. Three-dimensional numerical results on the saturation contours ($\sigma_n = S_n \phi$) of a three-phase immiscible fluid flow (water + diesel oil + air) in a dry soil using a spatial grid resolution of 0.50 *m* and a grid dimension of 160 *m* × 80 *m* × 27 *m*, at different times. A hydraulic gradient of 0.004. The spill is released from an oil pipeline at $(x, y, z) = (0,0,10)\ m$.

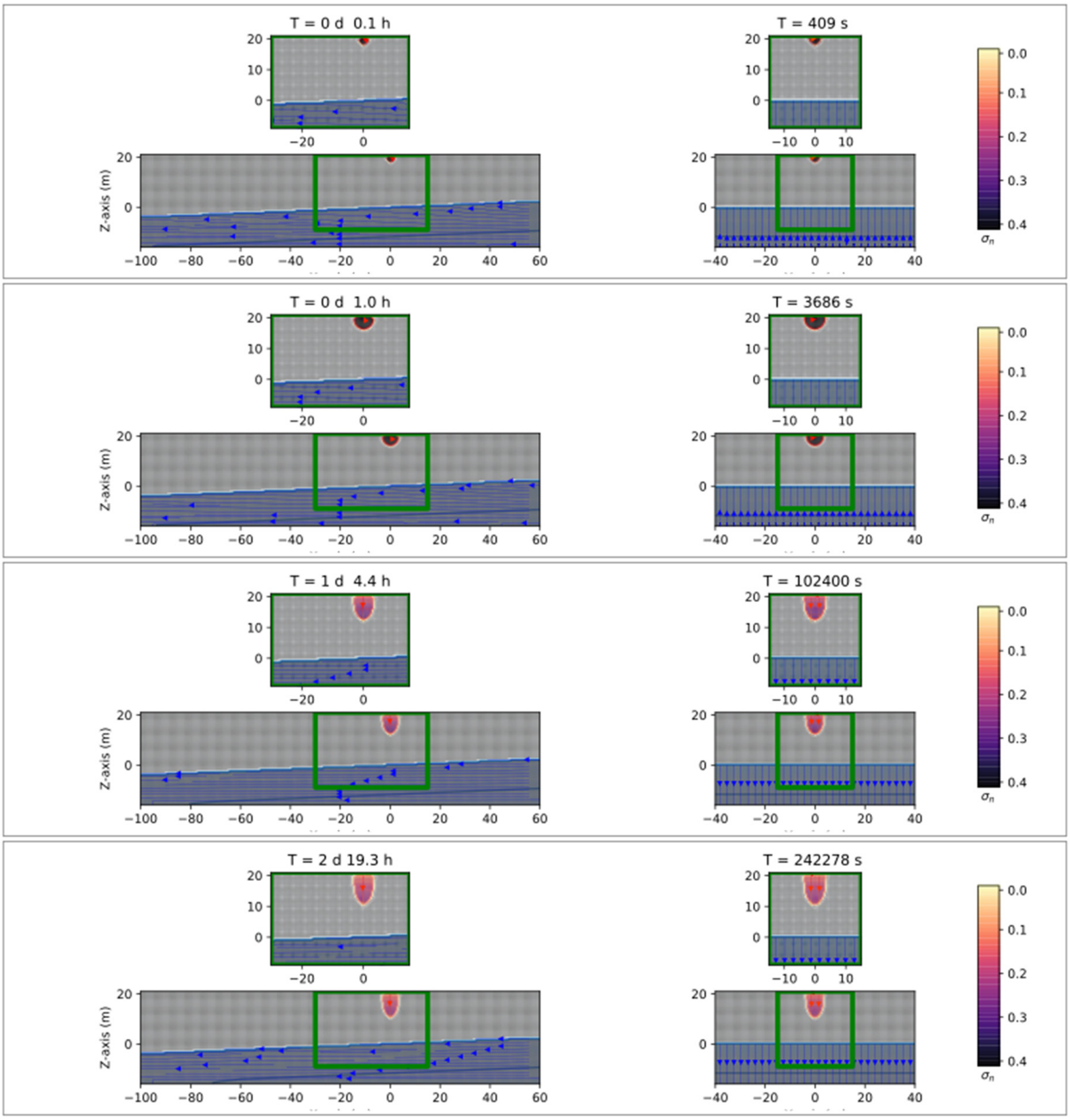

Figure S15. Three-dimensional numerical results on the saturation contours ($\sigma_n = S_n\phi$) of a three-phase immiscible fluid flow (water + diesel oil + air) in a dry soil using a spatial grid resolution of 0.50 *m* and a grid dimension of 160 *m* × 80 *m* × 37 *m*, at different times. A hydraulic gradient of 0.04. The spill is released from an oil pipeline at $(x, y, z) = (0,0,20)\ m$.

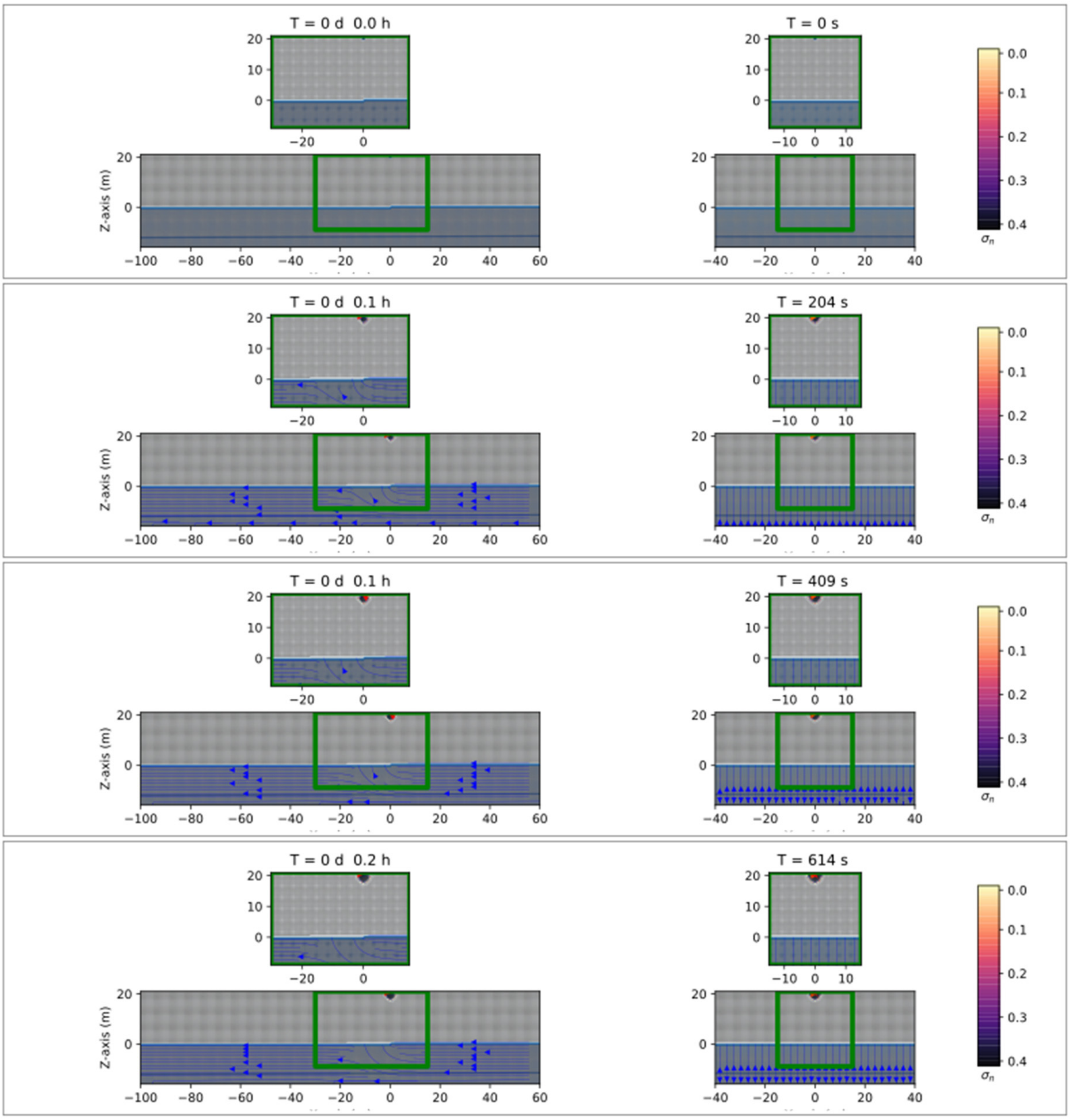

Figure S16. Three-dimensional numerical results on the saturation contours ($\sigma_n = S_n\phi$) of a three-phase immiscible fluid flow (water + diesel oil + air) in a dry soil using a spatial grid resolution of 0.50 *m* and a grid dimension of 160 *m* × 80 *m* × 37 *m*, at different times. A hydraulic gradient of 0.004. The spill is released from an oil pipeline at $(x, y, z) = (0,0,20)\ m$.